

20201007 - October's Specifications Committee Meeting

October Specifications Committee Meeting Agenda

Meeting Date

Wednesday, October 7, 2020 @ 9:00am

Skype Meeting. E-mail distribution message includes instruction.

Approved Permanent Specification changes from last Committee meeting (8/5/20)

- **219.5-Method of Measurement** Updates the cleanliness requirements.
- Three related spec changes related to corrosion resistant reinforcement:
 - **602.2-Materials & 602.11-Pay Items**
 - **709.1-Steel Bars for Concrete Reinforcement**
 - **709.15-Coated Dowel Bars & Dowel Bar Basket Assemblies**
- **601.7-Mixing** Clarify job site addition of water and super-p.
- **601.12.1-Curing Under Normal Conditions** Prohibits adding extra cement in large concrete elements to avoid thermal cracking.
- **707.4-SCMs for use in Portland Cement** Adds MP reference & updates fly ash requirements.
- **405.15-Method of Measurement, 405.16-Basis of Payment, and 405.17-Pay Items** Clarify how the item will be measured and paid for.

Approved Project Specific Special Provisions (SP) from last Committee meeting (8/5/20)

- **SP663 - Type S Marker**
- **SP521 - Full Depth Reclamation**

Items removed from Committee Agenda

- **401.14-Pay Items**
- **SP902 - Mine Subsidence**
- **108.6.2.1-Excusable Noncompensable Delays & 108.7.1-Failure to Complete on Time and Liquidated Damages**

Old Business - Provisions discussed at last Committee meeting

625	Section 625-Rock Socketed Drilled Shaft	<p>5th time to committee; discussed in February, April, June, & August.</p> <p>Proposed specification change to Section 625. It is a complete section rewrite.</p> <p>No update to the specification.</p> <p>Approval is expected in October.</p>
627	SP627-Modular Expansion Joint	<p>5th time to committee; discussed in February, April, June, & August.</p> <p>Special Provision for modular expansion joint.</p> <p>The SP has been updated per comments at the last meeting. A redline copy, showing the proposed changes from last meeting is included.</p> <p>Approval is expected in October.</p>

<p>601</p> <p>601.3.1.1-Mix Design Using Potentially Reactive Aggregate</p>		<p>4th time to committee; discussed in April, June, & August. Three specification changes related to Alkali-Silica Reaction (ASR)</p> <p>1. Proposed specification change to Section 601. Adding subsection 601.3.1.1 for mix design using ASR. ◦ 601.3.1.1 has been updated per comments at the last meeting; it is redline copy showing changes from August meeting.</p> <p>2. Proposed specification change to Section 501. Aggregate with applicable reactivity reference 601.3.1.1 subsection. ◦ No updates to 501.3.</p> <p>3. Proposed specification change to Section 603. Adds reference to 601.3.1.1 subsection. ◦ No updates to 603.6.2.</p> <p>There were meetings outside of spec committee with WVDOT personnel and industry related to these spec changes in April, June, & August.</p> <p>Approval is expected in October.</p>
<p>604</p>	<p>604.12-Inspection and Acceptance</p>	<p>4th time to committee; discussed in April, June, & August. Proposed specification change to Section 604. It further defines the rigid & flexible pipe criteria. And testing of the pipe.</p> <p>Specification has been updated per comments received on them. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>
<p>613</p>	<p>SP613-Spray Applied and Spin-Cast Pipe Lining</p>	<p>4th time to committee; discussed in April, June, & August. Special Provision for repair and rehabilitation culverts by spray applied and spin-cast pipe lining.</p> <p>The SP has been updated per comments from supplier. A redline copy, showing the proposed changes from last meeting is included.</p> <p>Approval is expected in October.</p>
<p>720</p>	<p>720.5.4-Schedule 3 NHS Pavement Projects</p> <p>720.6-Non-NHS Pavement Projects</p>	<p>4th time to committee; discussed in April, June, & August. Proposed specification change to Section 720. It removing invalid MP reference; updates the IRI / \$ adjustment table of schedule 3 NHS Pavement Projects; and revises non-NHS route requirements.</p> <p>Specification has been updated. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>There was a meeting with WVDOT personnel and industry related to these spec changes in late-June.</p> <p>Approval is expected in October.</p>

412	<p>Section 412 - Winter Grade Asphalt Patching Materials</p> <p>SP412 - Winter Grade Asphalt Patching Materials</p>	<p>3rd time to Committee; discussed in June & August.</p> <p>Two items related to Winter Grade Asphalt Patching Materials.</p> <ol style="list-style-type: none"> 1. Removal of entire Section 412 from specifications. The pay item has had minimal use in past 10 year. The revision will remove it from specifications and make it project specific special provision. 2. Language added to Special Provision. <p>No update to the specification or SP.</p> <p>Approval is expected in October.</p>
601	<p>SP601 - Lightweight Class H Concrete</p>	<p>3rd time to Committee; discussed in June & August.</p> <p>Special Provision for Class H Lightweight Concrete. This has been added to previous projects by plan note and SP will further address field issues associated with this type of work.</p> <p>No update to the SP.</p> <p>Approval is expected in October.</p>
604	<p>604.2-Materials</p> <p>604.1.1-Pipe Culverts Installed Using CLSM</p> <p>604.8.2-Final Backfill</p>	<p>3rd time to Committee; discussed in June & August.</p> <p>Proposed specification change to Section 604. The update adds Random Material to the material table; revises the trench width of type F trench, and clarifies the final backfill requirements.</p> <p>No update to the specification. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>
636	<p>636.3-Control of Traffic Through Work Areas</p> <p>636.25-Pay Items</p>	<p>3rd time to Committee; discussed in June & August.</p> <p>Proposed specification change to Section 636. The update updated temporary barrier and temporary guardrail barrier language. It also updates the Temporary Barrier pay items listed in the spec book.</p> <p>No update to the specification. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>
607	<p>SP607-High Tension Cable Barrier</p>	<p>2nd time to Committee; discussed in August.</p> <p>This is an update to previously approved SP. 2nd time to Committee.</p> <p>Project Specific provision for High Tension Cable Barrier. The revision allows only MASH compliant system to be installed.</p> <p>The SP has been updated; it is redline copy, showing the changes/updates to the existing special provision.</p> <p>Approval is expected in October.</p>

105	105.4-Coordination of Plans, Specifications, Supplemental Specifications, and Special Provisions	<p>2nd time to Committee. Two proposed spec changes related to use of Dual Unites (US Customary and Metric units) in the specifications. The update would require only US Customary be included, moving forward</p> <ol style="list-style-type: none"> 1. Proposed specification change to Section 105. The update is to remove dual units requirement. The revision is a redline copy, showing the proposed changes/updates to specification is included. 2. Proposed specification change to all specifications. The update is to remove metric units and only show US Customary in Standard Specifications; except for areas where metric is industry standard <p>No update to the specification. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>
ALL	Discontinue Dual Units	
103	103.6.5-Countersignature of West Virginia Agent	<p>2nd time to Committee; discussed in August. Two proposed specification changes related to WV law change, which no longer require countersignatures of WV insurance agents.</p> <ol style="list-style-type: none"> 1. Proposed specification change to Section 103. The update is to delete the subsection requiring countersignature of WV agent. 2. Proposed specification change to Section 107. The subsection is referencing the one above and being deleted, so tweaking paragraph to remove the reference. <p>No update to the specification; both are redline copy, showing the proposed changes/updates to the specification.</p> <p>Approval is expected in October.</p>
107	107.8.2.2-Railroad Protective Liability Insurance	
108	108.7.2-Interim Completion Date	<p>2nd time to Committee; discussed in August. Proposed specification change to Section 108. The update is to clarify that the standard liquidated damages are to be used for Interim Completion Date, unless otherwise specified.</p> <p>No update to the specification. It is redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>
219	219.4.1-Proportioning & 219.4.2-Testing	<p>2nd time to Committee; discussed in August. Proposed specification change to Section 219. The revision moves the pH testing requirement to the mix design development phase instead of construction.</p> <p>No update to the specification. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>

501	501.5.2.3-Scales	<p>2nd time to Committee; discussed in August.</p> <p>Two proposed specification changes related to concrete batch plant scales, adding reference MP 700.00.30.</p> <ol style="list-style-type: none"> 1. Proposed specification change to Section 501, subsection 501.5.2.3 2. Proposed specification change to Section 601, subsection 601.5.2.3
601	601.5.2.3-Scales	<p>No update to the specification. A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>
609	Section 609-Sidewalks	<p>2nd time to Committee; discussed in August.</p> <p>Proposed specification change to Section 609. The revision updates curb ramp requirements.</p> <p>Specification has been updated; it is redline copy, showing the proposed changes/updates to the specification.</p>
622	SP622 - Nail Laminated Timber Deck	<p>2nd time to Committee; discussed in August.</p> <p>Special provision for Nail Laminated Timber Deck on bridge.</p> <p>The SP has been updated; it is redline copy, showing the changes/updates to the existing special provision.</p> <p>Approval is expected in October.</p>
636	636.23-Method of Measurement	<p>2nd time to Committee; discussed in August.</p> <p>Proposed specification change to Section 636. It removes reference to 4 inch lines from the method of measurement of the three subsections below:</p> <ol style="list-style-type: none"> 1. 636.23.8-Eradication of Pavement Marking 2. 636.23.9-Temporary Pavement Markings-Paint 3. 636.23.10-Temporary Pavement Markings-Tape <p>Specification has been updated per comments at the last meeting. It is redline copy, showing the proposed changes/updates to specification is included.</p>
642	642.2-Materials, 642.5.4-Mulch, Fertilizer and Lime, & 642.7-Method of Measurement	<p>2nd time to Committee; discussed in August.</p> <p>Two proposed specification changes related anchoring of mulch. The revision updates the anchoring requirements and removes use of asphalt for anchoring.</p> <ol style="list-style-type: none"> 1. Proposed specification change to Section 642, subsections 642.2, 642.5.4, and 642.7 2. Proposed specification change to Section 652, subsection 652.2, 652.6.2, and 652.9
652	652.2-Materials, 652.6.2-Straw Mulch, & 652.9-Method of Measurement	<p>A redline copy, showing the proposed changes/updates to specification is included.</p> <p>Approval is expected in October.</p>

672	SP672 - Construct Building	<p>2nd time to Committee; discussed in August.</p> <p>Special provision for Construct Building. It has the building specifications govern over other items and also provides instruction on how the item would be paid for.</p> <p>The SP has been updated per comments at the last meeting. A redline copy, showing the proposed changes from last meeting is included.</p> <p>Approval is expected in October.</p>
-----	----------------------------	---

New Business - New Provisions for Spec Committee

SECTION	TITLE	DESCRIPTION
DBE	SP for DBE	<p>This is an update to previously approved SP. 1st time to Committee.</p> <p>Update to the DBE utilization Special Provision used on Federally Funded projects. The revision adds reference to the Civil Rights Compliance Division.</p> <p>The provision is redline copy, showing the changes/updates to the existing special provision.</p>
101	101.2-Definiations	<p>1st time to Committee.</p> <p>Four proposed specification changes related to finalization of projects.</p> <ol style="list-style-type: none"> 1. Proposed specification change to Section 101. The 101.2 update revises the definition of Substancailly Complete such that all items of work must be done and adds Completion definition. 2. Proposed specification change to Section 105. Subsection 105.16.2 is updated to specify 180 days for project finalization. 3. Proposed specification change to Section 108, subsection 108.6.1. The revision updates substantially complete to correlate with definition. 4. Proposed specification change to Section 109. Subsection 109.8 is revised; for 30 days to execute the final estimate. <p>All of the specification changes are redline copy, showing the proposed changes/updates to the specification.</p>
105	105.16.2-Final Acceptance	
108	108.6.1-General	
109	109.8-Acceptance and Final Payment	
109	109.1-Measurement of Quantities & 109.20-Load Limit Violations and Weight Tickets	<p>1st time to Committee.</p> <p>Proposed specification change to Section 109. The change is to facilitate use of e-ticketing.</p> <p>It is redline copy showing the changes to the existing specification.</p>

107	107.21.1-Erosion and Sedimentation Control	1st time to Committee. Three proposed specification changes related to WVDOH adoption of the WVDEP Erosion and Sediment Control Manual. The revision removes references to the WVDOH publication and replaces it with the WVDEP one.
207	207.6.3.1-Waste Within WVDOH Right-of-Way	1. Proposed specification change to Section 107, subsection 107.21.1 2. Proposed specification change to Section 207, subsections 207.6.3.1 3. Proposed specification change to Section 211, subsection 211.3.1 and 211.3.3
211	211.3.1-Borrow within WVDOH R/W Limits & 211.3.3-Impervious Core	A redline copy, showing the proposed changes/updates to each specification is included.
212	SP212 - Shoring, Causeway	1st time to Committee. Special provision for Shoring, Causeway.
403	SP403 - Crack Sealing in Asphalt Pavement	1st time to Committee. Special provision for crack sealing in asphalt pavement.
504	Section 504-Bituminous Underseal for Concrete Pavement SP504 - Asphalt Underseal for Concrete Pavement	1st time to Committee. Two items related to Bituminous Underseal for Concrete Pavement. The revision will remove it from specifications and make it project specific special provision. Section 504 pay items have had no use in past 10 years and Section 512-Concrete Slab Stabilization is similar procedure & probably better for this, if needed. 1. Removal of entire Section 504 from specifications. 2. Language added to Special Provision.
601	601.3.2.3-Yield	1st time to Committee. Proposed specification change to Section 601. The revision requires yield tests by the WVDOH filed inspector.
603	603.2.1-Inspection and Testing & 603.6.2.1-Class S-P Concrete Mix Design Testing:	1st time to Committee. Proposed specification change to Section 603. The revision adds certification requirements for QC personnel at concrete fabricators.
606	606.2-Materials & 606.2.3-Free Draining Base Trench	1st time to Committee. Proposed specification change to Section 606. The revision adds Outlet pipe material reference to 606.2 & updates reference to outlet pipe in 606.2.3.
615	SP615 - Alternative Technical Concept	1st time to Committee. Special provision for Alternative Technical Concept of Steel Superstructure elements: causeway shoring, temporary falsework, and jacking of steel superstructure.

626	626.7-Method of Measurement	<p>1st time to Committee. Proposed specification change to Section 626. The revision updates the method of measurement subsection, to clarify that the retaining wall items are as determined by the plan quantity.</p> <p>Specification is redline copy, showing the proposed changes/updates to the specification.</p>
636	636.6.2-Shadow Vehicle, 636.12-Temporary Impact Attenuating Device, & 636.25-Pay Items	<p>1st time to Committee. Proposed specification change to Section 636. The revision updates the shadow vehicle and temporary impact attenuating devices requirements, to meet MASH requirements.</p> <p>Specification is redline copy, showing the proposed changes/updates to the specification.</p>
642	642.1-Description, 642.4-General Requirements, & 642.7-Method of Measurement	<p>1st time to Committee. Proposed specification change to Section 642-Temporary Pollution. The revision removes 'check dam' item and references from the specification.</p> <p>Specification is redline copy, showing the proposed changes/updates to the specification.</p>
663	Section 663 - Pavement Markings and Rumble Strips	<p>1st time to Committee. Proposed specification change to Section 663. The revision adds rumble strip item to the section (this information is currently in Section 664 & being removed from there).</p> <p>Specification is redline copy, showing the proposed changes/updates to the specification.</p>
664	Section 664 - Impact Attenuators	<p>1st time to Committee. Proposed specification change to Section 664. It is a complete section re-write. The revision consolidates the various proprietary items into one generic specification. Specification is redline copy, showing the proposed changes/updates to the specification.</p>
715	Subsection 715.41- Impact Attenuators	<p>Also included is the material subsection for Impact Attenuator - 715.41. It is a complete subsection re-write. The proposed specification is attached.</p>
715	715.9.3.1-Drums	<p>1st time to Committee. Proposed specification change to Section 715; for the material subsection 715.9.3.1-Drums. Which would permit tire ring collars for drums in addition to the snap-on bases we have previously allowed.</p> <p>The specification is redline copy, showing the proposed changes/updates.</p>

Comments

Comments are requested on these Specification Changes and Project Specific Special Provisions. Please share your comments by October 5, 2020, they help in the decision making process.

Please Send Comments to: DOHSpecifications@wv.gov

Deadline for new items & updates to these provisions is November 7, 2020

If you are the 'champion' of any specification changes and/or project specific special provisions currently in the Specification Committee, it is your responsibility to edit/update/modify them in a timely manner per comments and discussion in Spec Committee. *Failure to submit updates may result in removal of item and/or delays.*

Next Meeting

Wednesday, December 2, 2020 at 9am

Skype Meeting and/or Group meeting location is in Building 5, Room 855 (*meeting invite will include details*)

2017 Standard Specifications Roads and Bridges & 2020 Supplemental Specifications

Electronic Copy (pdf): The 2017 Standard Specifications Roads and Bridges & 2020 Supplemental Specifications can be viewed, printed, or downloaded from the Specifications Website. A link to the Specifications pages is here: <http://transportation.wv.gov/highways/contractadmin/specifications>

Print Version: Hard copies of the 2017 Standard Specifications Roads and Bridges & 2020 Supplemental Specifications are available thru Contract Administration. An order form for the book is on Specifications Website. A link to the pages is here: <http://transportation.wv.gov/highways/contractadmin/specifications>

2020 Specifications Committee

The Specification Committee typically meet every other month; on the first Wednesday. 2020 meetings will be held in February (2/5), April (4/1), June (6/3), August (8/5), October (10/7), and December (12/2).

Calendar subject to change, updates will be given, as needed.

Specifications Committee Website

A copy of the meeting agenda can be found on the Specifications Committee Website

<http://transportation.wv.gov/highways/contractadmin/specifications/SpecComit>

Material Procedures

Material Procedures (MPs) referenced in provisions are available upon request.

For questions regarding the Standard Specifications Roads and Bridges, Supplemental Specifications, Project Specific Special Provisions, or the Specifications Committee please e-mail DOHSpecifications@wv.gov

File Format Structure and Progression of items thru Specifications Committee

The purpose of the below protocol is to provide guidance on the file structure of Proposed Specification & Project Specific Special Provision as they progress thru Specification Committee. This procedure would facilitate a means of tracking changes from meeting to meeting; as the agendas & provisions are posted publicly online on the Spec Committee website.

TYPES OF PROVISIONS:

There are three standard types of provisions typically discussed in committee:

1. Specification Changes – These are permanent changes to the WVDOT Standard Specifications.
 - o Unless inserted into a project proposal, these changes typically go into effect in January (of subsequent year) with the Supplemental Specifications.

2. Project Specific Special Provisions (SP) – Are applied to specifically designated projects.
3. Updates to previously approved SP – Changes/edits/updated to SP that have been approved by spec committee.

NEW BUSINESS ITEMS:

New items to should be setup & submitted in the following format:

1. Specification Changes – Shown as red-line copy (see note)
2. Project Specific Special Provisions (SP) – Will be shown in all black.
3. Updates to approved SP – Shown as red-line copy

Each item should also include a description with:

- Brief overview of item
- Background info and/or reason for change

NOTE: Red-line copy is a form of editing in which indicate removal or addition of text. You can redline a Microsoft Word document by using the built in “Track Changes” feature or you can manually redline document with font color changes & strike-through.

OLD BUSINESS ITEMS:

Updated provisions that were discussed at the last committee meeting should be setup in the following format:

- Redline copy from prior meeting would not be shown
- Redline copy of new changes/updates (from previous meeting)

PROGRESSION OF ITEMS THRU COMMITTEE AND APPROVAL:

Depending on how important the project and/or comments/discussion of item at previous meeting, then several things can happen in no particular order

- Few comments/discussion/minor changes ... will recommend approval of item at next meeting
- A lot of comments/discussion ... will not recommend approval at next meeting; item will be updated and reviewed again at next meeting.
- SP's in committee may be used in advertised project. Hope to work to address comments & finish approving at subsequent meeting.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 625
DRILLED CAISSON FOUNDATIONS**

DELETE THE ENTIRE CONTENTS AND REPLACE WITH THE FOLLOWING.

**SECTION 625
ROCK SOCKETED DRILLED SHAFT**

625.1-DESCRIPTION:

The work of this section includes the furnishing of all materials and the construction of rock socketed drilled shaft foundations consisting of reinforced concrete placed within the drilled excavations. Each rock socketed drilled shaft foundation shall consist of an upper drilled caisson portion in a steel casing and a lower rock socket portion.

625.2-SUBMITTALS:

The Contractor shall deliver all submittals required by this specification to the Engineer no later than one month prior to constructing any rock socketed drilled shafts shown in the plans. No rock socketed drilled shafts shall be constructed prior to the Engineer's review and acceptance of all submittals.

625.2.1-Experience:

1. A satisfactory record of experience in rock socketed drilled shaft construction is of the utmost importance in obtaining a satisfactory rock socketed drilled shaft installation. The installation of the drilled shaft is required to be performed by a contractor or specialty subcontractor specializing in installing and having experience with rock socketed drilled shafts of similar length, diameter, and subsurface conditions as those shown in the contract documents.
2. The Contractor shall submit data on at least two projects performed during the past ten years, for which the Contractor, or Contractor's key personnel who will be the on-site supervisor, have installed rock socketed drilled shafts of a range of diameters and lengths similar to those shown in the plans, in similar quantities, and under similar subsurface conditions. The list of projects shall contain names and phone numbers of owners' representatives who can verify the participation in those projects.
3. The Engineer shall review and approve the Contractor's (Subcontractor's) qualifications. If in the opinion of the Engineer the Contractor's qualifications are not

adequate, the Contractor shall submit to the Engineer a proposed method of obtaining the necessary qualifications.

4. The installation of all components of the drilled shaft including; drilling, reinforcement placement, concrete placement, and required wet hole condition work, casing installation and removal, slurry placement, and any other work required to complete the rock socketed drilled shaft, shall be performed by the approved contractor or specialty subcontractor.

625.2.2-Site Inspection: A signed statement shall be submitted affirming that the Contractor (or the Subcontractor if applicable) has inspected the project site and the available subsurface information including any available soil or rock samples.

625.2.3-Installation: The Contractor shall comply with applicable environmental regulations, including but not limited to the protection of river water from degradation due to material excavated from rock socketed drilled shaft locations or due to other harmful erosion, protection of the environment from slurry spillage or discharge if slurry is used, and general environmental protection of the area from all operations related to rock socketed drilled shafts.

The installation shall be in accordance with the Contractor's proposed Safety Plan per Section 625.6.1.7.

The Contractor shall provide a projected schedule of work to the MCS&T Division, DOHMCSSnTcaisson@wv.gov, thirty (30) days in advance of construction of drilled shafts. This projected schedule will be used by the MCS&T Division to schedule preinstallation core hole drilling and drilled shaft inspection.

625.2.4-As-Built Records: Within 24 hours of the completed construction of each drilled shaft, the Contractor shall submit a report on the actual location, alignment, elevation, and dimensions of the drilled shaft, and will also submit a completed drilled shaft log.

625.3: Blank

625.4-DIMENSIONAL REQUIREMENTS:

If the specified dimensional requirements are not met, the Contractor shall submit a corrective plan for any deviation from the drilled shaft location, alignment and elevation tolerances, and reinforcement dimensional requirements to the Engineer for approval. This approval may take up to fourteen (14) calendar days. The corrective plan shall be certified (signed by a Professional Engineer licensed in West Virginia knowledgeable in rock socketed drilled shaft installation). The cost of any corrective action shall be borne by the Contractor.

625.5-MATERIALS:

625.5.1-Concrete: Concrete for the rock socketed drilled shafts shall be Class DC and shall conform to the requirements of Section 601.

The design 28-day compressive strength shall not be less than 4500 psi (31 Mpa) unless shown otherwise in the Plans. The Contractor shall prepare a mix design in accordance with MP 711.023.23 to attain this strength. Slump for dry placement shall be 7 inches (175 mm) plus-or-minus 1 inch (25 mm). Unless otherwise specified in the Plans, the cement shall be Type I.

For placement of concrete by tremie or pumping, the cement factor shall be increased by

94 lbs. (43 kg) from the original design cement factor, the slump shall be 8 inches (200 mm) plus-or-minus 1 inch (25 mm) and shall maintain a slump in excess of 4 inches (100 mm) throughout the concrete placement.

625.5.2-Reinforcing Steel: Reinforcing steel for main vertical bars and ties shall conform to Section 709.1, deformed type, grade 60 (400). Reinforcing steel for use as spirals shall conform to Section 709.1, plain type, grade 60 (400).

625.5.3-Casing: Metal casing shall be used in the caisson portion of the shaft to prevent caving of the soil material or to exclude ground water. Casing shall be metal, of unit or sectional construction, be strong enough to withstand handling stresses, withstand the pressures of concrete and of the surrounding earth and ground water, and prevent seepage of water. Also, the casing used shall be selected by the Contractor to control dimensions and alignment of excavations within tolerances, to seal the casing into impervious materials, and to execute all other construction operations.

Casing pipe used for permanent applications shall be new material and conform to ASTM A 252/A 252M, Grade 2. Casing pipe, when used for temporary applications only, will initially be required to meet the requirements of permanent pipe but when removed can be transferred to the contractor's stock and reused on subsequent projects.

Any required casing splices shall be welded with no interior splice plates, producing true and straight casing. All welding shall be in accordance with ANSI/AWS D1.1.

Permanent casing is required in all drilled shafts where noted on the plans. All temporary casing shall be removed during placement of concrete unless otherwise noted on the plans. Should the Contractor be unable to remove the temporary casing or if conditions require the temporary casing remain in place, the Contractor shall pressure grout the annular space between the casing and soil. Materials and methods for grouting operation shall be submitted to the Engineer for approval for the grouting operation. There shall be no additional cost to the Division for the grouting operation.

625.5.4-Crosshole Sonic Logging (CSL) Testing Tubes: Tubes required for CSL Tests shall be ASTM A53, Grade B, nominal 2-inch (50 mm) diameter. Hydrostatic test requirements are waived. Threaded Couplings shall be used per ASTM A 865.

625.5.5-Thermal Integrity Profiler (TIP) Wires: Wire, equipment, and testing procedure shall conform to ASTM D7949, Method B.

625.6-CONSTRUCTION: The following sequence describes a generalized construction method that is expected to be appropriate for the installation of the rock socketed drilled shafts. Deviations will be permitted with the Engineer's approval.

- a. Contractor shall provide suitable access to the "Preinstallation Core Hole" location at each drilled shaft.
- b. Drilling of a "Preinstallation Core Hole" will be performed by the Division as specified in 625.7.2.1.
- c. Drilling of cased hole through the soil overburden down to top of competent rock. Seating bottom of casing to minimize entry of ground water.

- d. Drilling of rock socket to the minimum diameter shown in the plans and to an elevation shown on the drawings or otherwise directed by the Engineer.
- e. Determination of wet or dry hole condition, by the Division, as specified in 625.7.2.2.
- f. Inspection of drilled hole for plumbness, by the Division, as specified in 625.7.2.3.
- g. Cleaning of the drilled hole by the Contractor, particularly the rock socket and the inside face of the casing, as specified in 625.7.2.5.
- h. Inspection of the drilled shaft sidewall and bottom cleanliness, by the Division as specified in 625.7.2.4 and 625.7.2.5.
- i. Placement of the pre-assembled cage of reinforcing steel with CSL tubes and/or TIP wires and securing it in place against movement during concreting and during casing withdrawal, as specified in 625.6.2. It also must be secured in such a way that the minimum clear cover over the bars is maintained.
- j. Placement of concrete in either dry or wet conditions. The temporary casing shall be withdrawn carefully and slowly so as not to leave any voids in the concrete and so as not to dislocate any reinforcing steel. Any concrete not meeting this specification's slump requirements will be rejected.
- k. Curing, stripping, and finishing shall be the same as for other structural concrete. Casing may be used as forms.
- l. Inspection of the concrete, by the Division as specified in 625.7.2.6.
- m. Corrective measures for any unacceptable drilled shaft, removal of water from the CSL tubes and filling with an approved grout. All core holes, as specified in 625.7.3, must be filled with an approved grout.

625.6.1-Excavation:

625.6.1.1-Scope: The Contractor shall perform all excavations required for the drilled shafts and the rock sockets, through whatever materials are encountered, to the dimensions shown in the plans, or required by the site conditions, or directed by the Engineer. The Contractor shall make each drilled shaft excavation available to the Engineer for inspection, providing tools, equipment, and safety measures as hereinafter specified. Based on preinstallation core hole information or on general inspection of the rock socket, the Contractor shall drill the rock socket deeper if directed by the Engineer.

625.6.1.2-Excavation through Overburden: Unless otherwise shown in the plans, rock socketed drilled shaft excavations in the overburden shall be vertical bored holes extending from the ground surface down to the surface of competent rock. Temporary or permanent casings shall be required down to the competent rock surface and be seated in rock in a manner that prevents caving and minimizes the entry of ground water. In the event of a groundwater condition, appropriate measures shall be taken subject to the Engineer's approval. Such measures may include pumping from within the excavation, external dewatering, or excavation through a slurry-filled hole until the casing can be seated and sealed.

625.6.1.3-Excavation in Rock: Rock sockets shall be excavated to the dimensions and depths shown in the plans, forming a bearing area at the bottom of the socket, flat to within a tolerance of 1/2 inch per foot. Each socket shall be excavated into continuous rock for the indicated length. Blasting methods will not be permitted.

The top elevation of competent rock must be confirmed as the socket drilling is started.

The effective "top elevation" is based on observation of the boundary zone where broken or weathered rock becomes competent rock and is also influenced by the presence of any shale or coal seams. Based on that elevation, and the information from the preinstallation core hole, the Engineer will determine the final depth of socket and bottom elevation.

Upon completion of each rock socket excavation, the Engineer may (1) accept the socket, or (2) order deeper excavation based upon preinstallation core hole data or general inspection of the socket. The adequacy of each socket will depend on the soundness of its bottom surface and on the soundness of its underlying layers.

Contractor is cautioned not to over-drill the rock sockets. Unauthorized over-drilling will be at the Contractor's expense. In the case where over-drilling would bring the drilled shaft base too close to a coal seam or other weak layer, then drilling must be extended through such weak layer, at the Contractor's expense, to a satisfactory deeper bearing level as determined by the Engineer.

No portion of the rock socket shall be exposed to drilling fluid or groundwater for more than 96 hours. Any portion of the rock socket exposed to drilling fluid or water for more than 96 hours, and any portion of the rock socket which, in the opinion of the Engineer, has deteriorated due to exposure to air or water, shall be reamed with an approved grooving tool to a depth of not less than $\frac{1}{4}$ inch (6 mm), or as directed by the Engineer. Reaming of the socket, if necessary, is considered incidental to the cost of drilling the rock socket, and no separate payment will be made for this work.

625.6.1.4-Providing for Socket Inspection: Upon completion of the excavation of each rock socket, and upon mechanical cleaning of the socket, the Contractor shall make the socket available to the Engineer for inspection, as specified in 625.7.

625.6.1.5-Disposal of Materials: Disposal of excavated materials shall be accomplished under the general provisions of Section 207.6.

625.6.1.6-River Area: Rock socketed drilled shaft construction in the river shall employ whatever special methods the Contractor finds necessary for access and for accomplishing the work. These methods may include cofferdams, temporary causeway, or other suitable measures. The Contractor will be responsible for conforming to all regulatory and environmental requirements related to the river and for obtaining any permits that are required by his river operations.

625.6.1.7-Safety Measures: Safety of all persons is to be considered an objective of the utmost importance on all projects. Therefore, the Contractor shall take whatever measures are necessary to protect his own personnel, his subcontractors' personnel, the Engineer or other agents of the state, regulatory personnel, and others including the general public. The following list is presented as representative of issues that the Contractor must address. It is not intended as all-inclusive and does not relieve the Contractor of conforming to other regulations, laws, requirements, or other measures reasonably required for safe excavating operations. The Contractor shall develop a safety plan in accordance with these requirements and provide this plan to the Engineer for his review.

- a. Any required equipment within an excavation shall be operated by air or electricity. The use of gasoline-driven engines or diesel engines within an excavation will not

be permitted. All lighting shall be electric, and precautions shall be taken regarding potential short circuits of electric current within ground water.

- b. The Contractor will take precautions to assure that no explosive or noxious gases are present. Fresh air shall be supplied into the excavation and foul air shall be removed whenever any personnel are present in the hole.
- c. A safety harness or chair lift, with separate safety line, protective cage, and two-way radio communication shall be used for any entry into an excavation.
- d. No open excavation shall be left unattended. During non-working hours excavations shall be protected using solid, safe covers that are firmly fastened in place.

625.6.2-Reinforcing Steel Installation: Prior to installation of reinforcing steel, the steel cage shall be checked and cleaned of any materials that would tend to prevent bonding. The excavated hole shall also be checked, and any remaining or newly deposited debris shall be removed. Immediately upon the Engineer's approval of the condition of the cage and his acceptance of the socket, and just prior to placement of concrete, the fully assembled cage of reinforcing steel shall be installed into the excavation.

The cage will consist of longitudinal (vertical) bars, spiral or tie bars, cage stiffener bars as required, spacing devices, and any other appurtenances required to maintain alignment, shape, and clearances. Cages shall include steel tubes and TIP wires in shafts where CSL and TIP testing is to occur as outlined in 625.6.2.1. Each cage shall be placed in one unit by lowering into the hole in a manner that will prevent distortion. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals (near the bottom and at intervals not exceeding 10 ft (3 000 mm) along the drilled shaft) to ensure concentric spacing for the entire cage length. The minimum number of centering devices at each level shall be three. All steel centering devices with less than 3 inches (75 mm) of concrete cover shall be epoxy coated. The cage shall be supported from the top by use of a ground surface frame or other positive means. Setting the cage on the socket bottom without support will not be permitted. The Contractor may, with the approval of the Engineer, remove the top support after sufficient concrete has been placed to adequately support the cage vertically and prevent distortion or racking of the cage.

The bottom of the reinforcing steel cage shall be a minimum of 3 inches (75 mm) and a maximum of 24 inches (600 mm) from the bottom to the rock socketed drilled shaft excavation. Additional clearance may be approved by the Engineer.

All intersections of rock socketed drilled shaft reinforcing steel shall be tied with cross or "figure 8" ties. The reinforcing steel in the drilled shaft shall be 100% tied and supported so that the reinforcing steel will remain within allowable tolerances for position. Unless otherwise shown in the plans, splicing shall be by mechanical connectors or couplers which develop at least 125% of yield strength of the reinforcing bar. No more than 50% of the longitudinal reinforcing shall be spliced within 60 bar diameters of any lapped splice location or within 2 ft (600 mm) of any mechanical splice or coupler location. Cage stiffener bars shall be used as required to provide a reinforcement cage of sufficient rigidity to prevent racking, permanent deformations, etc. during installation. If the concrete is to be placed by the free-fall method, these bars must first be removed.

In the event that the drilled shaft has been excavated below the anticipated tip elevation, the reinforcing cage may be extended at the tip (bottom) end by lap splices, mechanical connectors, or welded splices in conformance with the Standard Specifications. In this instance, splices need not be staggered and 100% of the reinforcing bars may be spliced at a given location. Lap splice

lengths shall be as shown in the plans or approved by the Engineer.

Prior to placing the reinforcement cage, the Contractor shall demonstrate to the satisfaction of the Engineer that the fabrication and handling methods to be used will result in a reinforcing cage placed in the proper position, with the proper clearances, and without permanent bending or racking of the reinforcement cage.

The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the rebar cage is not maintained within the specified tolerances, corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional drilled shafts shall be constructed until the Contractor has modified his reinforcement cage support system in a manner satisfactory to the Engineer.

625.6.2.1-Contractor Preparation for Testing: To accommodate the CSL and TIP test requirements, the Contractor shall install the appropriate number of tubes and/or TIP wires in each drilled shaft to be tested. The number of tubes and wires per drilled shaft shall be as tabulated below:

TABLE 625.6.2.1

Drilled shaft Diameter	Number of CSL Tubes	Number of TIP wires	Tube / Wire Spacing
< 42" (1049 mm)	3	0	120°
42" to ≤ 60" (1050 mm to 1499 mm)	4	0	90°
> 60" to ≤ 96" (1500 mm to 2399 mm)	6	6	60°
> 96" (2400 mm)	8	8	45°

The tubes shall be per 625.5.4. Each tube shall have a round, regular internal diameter free of defects or obstructions including defects or obstructions at pipe joints; in order to permit the free, unobstructed passage of 1½ inch (35 mm) diameter source and receiver probes. The tubes shall be watertight and free from corrosion with clean internal and external faces to ensure passage of the probes inside and a good bond with the concrete outside.

Each tube shall be fitted with a watertight shoe on the bottom and a removable cap or plug on the top. The tubes shall be securely attached to the interior of the reinforcing steel cage. The tubes are typically wire-tied to the reinforcing cage every 40 inches (1 000 mm), or otherwise secured such that the tubes stay in position during placement of the cage and during placement of concrete. The tubes shall be installed in each shaft in a regular, symmetric pattern such that the tube spacing in degrees will correspond to that shown in the table above.

The tubes shall be as near to parallel as possible. They shall extend from 6 inches (150 mm) above the drilled shaft bottom to at least 40 inches (1 000 mm) above the drilled shaft top. No tube may be allowed to rest on the bottom of a drilled excavation. If the drilled shaft top is sub-surface, then the tubes shall extend at least 2 ft (600 mm) above the ground surface or above the water surface if the ground surface is below water. Any joints required to achieve full length tubes shall be made watertight. The Contractor shall investigate all CSL tubes, making sure that there are no bends, crimps, obstructions or other impediments to the free passage of the testing probes. A record of the tube lengths, including a note of the projection of the tubes above the top of the shaft shall be made. The Contractor shall provide information on the shaft bottom and top elevations, length and construction dates to the Engineer prior to

the CSL tests. Care shall be taken during placement of the reinforcing steel cage so as not to damage the tubes.

After placement of the cage, and before placement of concrete, the tubes shall be filled with clean water and the tube tops shall be capped or sealed to keep debris or other foreign matter out of the tubes. Care shall be exercised in the removal of caps or plugs so as not to apply excess torque, hammering, or other stresses that could break the bond between the tubes and the concrete.

The TIP wires shall be per 625.5.5.

625.6.3-Placement of Concrete: Method of placement shall be determined by measuring the water infiltration rate into the shaft as specified in Section 625.7.2.2. Concrete placement for wet hole shall be placed by tremie. Free fall placement shall be permitted for dry hole condition, except that free fall height shall not exceed 5 feet (1500 mm) unless the concrete is placed using a drop chute or centering device. Free fall height is not restricted as long as a drop chute or centering device is used, and the concrete is directed down through the center of the shaft without directly hitting the reinforcing cage or the sides of the hole. Dry hole shall not have more than 3 inches of water in the bottom of hole at start of concrete placement.

Prior to concrete placement, the Contractor shall make all necessary arrangements to ensure the uninterrupted delivery of concrete so that there will not be any cold joints in the drilled shafts. Placement of concrete shall generally conform to the applicable portions of Section 601.10. The rate of placement of concrete, as related to the height of fresh concrete at any time, will be subject to the Engineer's approval. The placement method will be developed by the Contractor, taking account of set time, hydraulic pressures and casing removal.

All costs of replacement of defective drilled shafts shall be the responsibility of the Contractor and shall be at no cost to the Division.

After the concrete level has reached the required top elevation, it shall be forced to overflow in the case of tremie or pump placement, leaving only fresh, uncontaminated concrete. In the case of placement by free fall (dry conditions), the concrete shall be continued high enough to compensate for any settlement due to removal of casing.

The top 10 ft (3000 mm) of each rock socketed drilled shaft shall be vibrated except when more than 10 ft (3000 mm) is to be exposed above the ground line or the riverbed, then the entire exposed portion shall be vibrated. The concrete shall not be vibrated until after any temporary casing is removed. Exposed portions of each rock socketed drilled shaft shall be cured in accordance with Section 601.12.

625.6.4-Removal of Casing: Removal of the casing from a shaft may occur gradually as concrete is placed. Insofar as possible, casing extraction shall be done at a slow uniform rate by application of a steady vertical upward pull in the direction of the axis of the shaft. To facilitate extraction, tapping on the casing, exertion of temporary downward pressure, slight rotation, or the controlled use of a vibratory hammer will be permitted, but care must be taken to avoid harmful impacts or disturbances to the fresh concrete. Vibration or rodding may not be used to break the casing loose for extraction.

If, during extraction of casing, upward movement of concrete and/or reinforcing steel occurs, the Engineer shall be notified immediately. If the Engineer considers the movement to be minor, then the extraction of the casing may continue. If, however, the movement is deemed significant and indicative of squeezing of the surrounding soil thus resulting in a reduction of the drilled shaft

diameter, then the Engineer may order the casing to be left in place, or permit extraction to proceed and order a later non-destructive load test, or may order other procedures as appropriate at no additional cost to the Division.

For the upper portions of rock socketed drilled shafts that will be exposed and visible, the casing may remain in place as a form until the concrete has attained a strength that enables it to stand alone without further deformation. Casing shall then be removed.

625.7-INSPECTION OF SOCKETS:

625.7.1-Inspection: The Engineer will inspect the shaft as outlined in 625.7.2.4 and 625.7.2.5.

Time required for inspection will be considered incidental to the work and will not be cause for extra compensation related to a claim or extension of contract time.

625.7.2-Division Testing:

625.7.2.1-Preinstallation Core Holes: The Contactor shall provide notice to the MCS&T Division via e-mail (DOHMCSTcaisson@wv.gov) when each site is ready for drilling. The Division will commence drilling of the preinstallation core hole within 5 working days after notification from Contractor that site has suitable access for drilling.

A preinstallation test boring will be drilled by the Division at each drilled shaft location, or as shown on the plans, to determine the character of the material that the drilled shaft extends through and the material that is at the base of the shaft in order to ensure the material along and below the tip of the rock socket is capable of carrying the load that will be imposed on it. The preinstallation borings are to be drilled prior to beginning excavation for each representative rock socketed drilled shaft. The Contractor shall provide all work necessary to allow access for the drill rig to the preinstallation test boring location, which at a minimum shall include constructing drill pads and access roads.

Unless otherwise directed, the preinstallation test borings are to be extended a minimum depth of 2 drilled shaft diameters but not less than 10 feet below the planned tip elevation of the rock socketed drilled shaft shown on the plans. Standard Penetration Testing (SPT) and sampling shall be performed at 5-foot intervals in the preinstallation borings in accordance with AASHTO T 206. Rock coring will be performed in accordance with ASTM D2113 using a wireline core barrel system and will commence immediately upon obtaining an SPT value of 50 blows per 6-inches or less on bedrock. The recovered core sample size will be approximately 2-inch diameter (NX or NQ size). Additional preinstallation test borings in other locations may be required where directed by the Engineer.

Test boring logs of each preinstallation boring will be prepared by the Division and will be provided to the Contractor within 3 working days of completion of the test boring. The preinstallation test borings logs will describe the type and thickness of all soil and rock layers, and locate the presence of groundwater, open joints, voids, soft rock, or other deleterious material. All recovered soil and rock samples shall be maintained by the Division and stored on site at suitable location, provided by the Contractor, until completion of the project.

Within 10 working days after completion of preinstallation core hole, the Engineer will notify the Contactor of the final tip elevations for each drilled shaft location.

625.7.2.2-Wet or Dry Hole Determination: The Division will check the depth of water at the bottom of the drilled shaft. If the depth does not increase by more than 12 inches over a 1-hour period, the hole will be considered dry. Otherwise, the hole will be considered wet.

625.7.2.3-Plumbness: Contractor shall provide notice to the MCS&T Division via e-mail (DOHMCSnTcaisson@wv.gov) 5 working days prior to the date each drilled shaft will be ready for inspection.

Plumbness of the rock socketed drilled shaft/rock socket shall be measured by the Division by measuring the geometry of the drilled shaft excavation using SHAPE, Sonicaliper, or other suitable means. For any rock socketed drilled shaft, the maximum permissible deviation from plumb shall be 1.5% measured with respect to the vertical axis at the center of the drilled shaft excavation.

The Contractor shall provide suitable access and means for lowering inspection equipment into the drilled shaft excavation.

For any rock socketed drilled shaft at its top, the maximum deviation of the center shall be 3 inches from its project plan location. The maximum deviation of the finished top of shaft from the plan elevation shall be minus 1 inch or plus 3 inches. An absolute minimum cover of 3 inches to the reinforcing steel is strictly required. In the event of any deviations in the dimensional requirements, the contractor shall not proceed with construction of pier columns or cap until submission and approval of a corrective plan has been granted.

625.7.2.4-Rock Sock Sidewall Inspection: Contractor shall provide notice to the MCS&T Division via e-mail (DOHMCSnTcaisson@wv.gov) 5 working days prior to the date each drilled shaft will be ready for inspection.

The Division will inspect the rock socket side walls with a downhole camera or other suitable device. The Engineer shall evaluate the rock quality and construction, as outlined in 625.6.1.3.

625.7.2.5-Shaft Bottom Cleanliness: Contractor shall provide notice to the MCS&T Division via e-mail (DOHMCSnTcaisson@wv.gov) 5 working days prior to the date each drilled shaft will be ready for inspection.

The contractor shall clean the rock socket so that a minimum of 75% of the base will have less than ½ inches of sediment at the time of placement of the concrete. Sediment depth at any location shall not exceed 1 ½ inches. The Division shall determine shaft cleanliness by using a mini-SID, SQUID, or other suitable device. The contractor shall use an air-lift to achieve the required bottom cleanliness.

The contractor shall begin concrete placement in the shaft within 3 hours after the shaft bottom cleanliness is approved. If concrete placement in the drilled is not started within 3 hours, the rebar cage shall be removed, and hole shall be re-inspected at no additional time to the Contractor or cost to the Division.

625.7.2.6-In-place Concrete Quality Testing: The Contractor shall furnish and place the Crosshole Sonic Logging (CSL) tubes and thermal integrity profiler (TIP) wires in all drilled shafts. The number of tubes and tip wires to be used shall be as specified in 625.6.2.1. The Division will perform the testing and provide a report of the drilled shaft

integrity testing to the Contractor. The CSL tubes shall remain open in the shaft and be grouted by the Contractor after acceptance of that shaft.

625.7.2.6.1-Crosshole Sonic Logging (CSL): The nondestructive testing method known as CSL shall be used on any rock socketed drilled shaft which is constructed with the placement of concrete under wet conditions or as required in the plans. The testing shall not be conducted until at least three (3) days after placement of concrete is concluded in the drilled shaft and will be completed within fourteen (14) calendar days after such placement.

The CSL tests shall be conducted in conformance with ASTM D6760 and by a testing company approved by MCS&T Division.

The Contractor shall comply with the scheduling and notification requirements for drilled shaft construction outlined in Section 625.2.3 by contacting the following MCS&T Division e-mail address: (DOHMCSnTcaisson@wv.gov). This will allow MCS&T Division to provide a qualified company to perform testing within the time frames allotted for in this subsection.

625.7.2.6.1.1-CSL Testing Results: The CSL test results will be compiled into a drilled shaft integrity testing report for each drilled shaft. The report will summarize and analyze any defect zones indicated on the logs. A copy of each report will be provided to the Contractor.

625.7.2.6.1.2-Evaluation of CSL Test Results: The Engineer will review the report and, if the report determines that the drilled shaft is acceptable, will submit to the Contractor in writing within seven (7) calendar days approval to proceed with the work.

The rating of the rock socketed drilled shaft integrity will consider the increases in first arrival time (FAT) and the energy reduction relative to the FAT or energy in a nearby zone of good concrete. The criteria for rating the concrete from the CSL test will be:

TABLE 625.7.2.6.1.2	
Rating	Criteria
Good (G)	FAT increases 0-10% and energy reduction < 6 db
Questionable (Q)	FAT increases 11-20% and energy reduction < 9 db
Poor / Flaw (P/F)	FAT increases 21 to 30% or energy reduction of 9 to 12 db
Poor / Defect (P/D)	FAT increases 31% or more or energy reduction >12 db

Flaw or defect zones as indicated in Table 625.7.2.6.1.2 will be indicated on the logs and listed in a table within the report. The flaw or defect zones and their horizontal and vertical extent will be discussed in the report text. Flaws will be addressed by the Division if they affect more than 50% of the tested tube pairs at the same depth. Defects will be addressed by the Division if they affect two or more of the tested tube pairs at the same depth. At a minimum, addressing flaws and defects will include Crosshole Tomography (CT). If it is determined that the rating is less than Questionable, based on the results of the CSL and CT testing, the Division will require core drilling and sampling by the Contractor for further evaluation of the flaw or defect at no additional cost to the Division. The diameter, number, depth, and location of cores shall be as directed by the Engineer.

The acceptance of each drilled shaft shall be the decision of the Engineer, based on the results of the drilled shaft integrity testing report and other information on the drilled shaft

placement. Rejection of a drilled shaft shall require conclusive evidence that a defect exists in the drilled shaft, which will result in inadequate or unsafe performance under service loads. If the Non-Destructive Testing records are complex or inconclusive, the Engineer will require the Contractor to verify drilled shaft conditions by core drilling. If a flaw or defect is confirmed, the Contractor shall pay for all coring and grouting costs. If no flaw or defect is encountered, compensation for all coring and grouting will be in accordance with 104.3 and 109.4.

625.7.2.6.1.3-Remedial Action: In the case that any drilled shaft is determined to be unacceptable, the Contractor shall submit a plan for remedial action to the Engineer for approval. The approval or rejection of the remediation plan may take up to fourteen (14) calendar days. If the remediation plan is rejected the Contractor shall revise the plan and submit it for approval and the approval time is restarted. Any modifications to the foundation drilled shaft and load transfer mechanisms caused by the remedial action will require calculations and working drawings stamped by a Professional Engineer licensed in the State of West Virginia for all foundation elements affected. All labor and materials required to perform remedial drilled shaft action shall be provided at no cost to the Division and with no extension of the contract time.

625.7.2.6.2-Thermal Integrity Profiler (TIP): Perform TIP testing using the embedded thermal wire array, and in accordance with the ASTM test method D7949 (method b). Thermal integrity profiling is performed to evaluate shaft integrity and location of the reinforcing cage. The number of wires to be used shall be as specified in 625.6.2.1. Thermal wire cables shall be connected to a thermal access port (TAP) immediately following casting.

The Contractor shall provide cooperative assistance and labor as required to assist the Division in inspecting the thermal wires prior to concreting the shaft. Prior to TIP testing, the contractor shall provide shaft installation details to the TIP consultant. Because the method relies on the heat of hydration, tip testing is generally performed between 8 and 48 hours of concrete placement (note the optimum TIP testing time is dependent on shaft size and concrete mix and could range from 4 to 72 hours).

625.7.2.6.2.1-Criteria to be used for acceptance or rejection of rock socketed drilled shaft using TIP testing: The rating of the shaft integrity using tip shall consider variations in temperature as measured by the thermal wires. Potential local anomalies may be indicated by locally low temperatures relative to the average temperature at that depth, or average temperatures significantly lower than the average temperatures at other depths. The criteria for rating the concrete from the TIP test shall be:

Satisfactory (s) = 0 to 6% effective radius reduction and cover criteria met

Anomaly (a) = effective radius reduction > 6% or cover criteria not met

When a tested shaft is categorized as anomaly (a), slices modeled at the area of question may be provided so that a structural evaluation of the shaft can be performed prior to implementing any corrective measures. Core drilling shall be performed to investigate problem areas found during TIP testing.

625.7.3-Evaluation by Core Drilling: A rock socketed drilled shaft that is found to be unacceptable shall be core drilled by the Contractor in accordance with ASTM C42. Cores shall be 4" nominal diameter. One or more core holes shall be drilled at the location(s) as determined by the Engineer. An accurate log of the core shall be kept, and the core shall be crated and properly marked showing the drilled shaft depth at each interval of core recovery. The core and one copy of the coring log shall be provided to the Engineer.

The Engineer shall determine if the rock socketed drilled shaft is acceptable. The Engineer will submit to the Contractor in writing within seven (7) calendar days approval to proceed with the work. If the quality of the drilled shaft is determined to be unacceptable, then the Contractor shall proceed in accordance with 625.7.2.6.1.3.

625.8-METHOD OF MEASUREMENT:

Rock socketed drilled shafts and Rock Socket foundations will be measured by the linear foot (meter). For payment purposes, the drilled shafts are the portion from the finished top of each rock socketed drilled shaft to the top of competent rock. Rock Socket is the portion from the top of competent rock to the bottom of the drilled shaft rock socket as shown in the plans or as directed by the Engineer. Each measured drilled shaft is to be complete in place, accepted, and ready to function. "Top of drilled shaft" is the top of concrete as shown in the plans. "Top of competent rock" is as tabulated in the drilled shaft schedules in the plans unless a difference of one 1 foot (300 mm) or more is found during drilling.

625.9-BASIS OF PAYMENT:

The accepted quantities of rock socketed drilled shaft foundations, measured as provided above, will be paid for at the contract unit price per linear foot (meter); complete in place including excavation, slurry if required, temporary or permanent metal casing, steel reinforcing, concrete, curing, and any required forming and finishing. No additional payment will be made for temporary casing that remains in place and pressure grouting due to the Contractor's inability to stabilize a drilled excavation, for the need to place concrete by tremie or pumping, for the need to use slurry for drilling, or for extra excavation and concrete that may be required due to drilling diameters larger than the minimum diameters specified. No additional payment will be made for methods employed to gain access to drilled shaft construction or for means required to provide a dry working environment within the drilled shafts. Tubes for CSL testing, TIP wires, and other responsibilities related to testing and inspection assistance are incidental, with no separate payment being made.

625.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
625001-*	Drilled shaft "D" Diameter	Linear Foot (Meter)
625003-*	"D" Rock Socket	Linear Foot (Meter)

* Sequence number

D = Diameter of shaft, in inches (millimeters)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 627

MODULAR EXPANSION JOINT SYSTEM

627.1-GENERAL:

627.1.1-Description: This work is the furnishing of material, services, labor, tools, equipment, and incidentals necessary to design, fabricate, inspect, test and install each fabrication, provision and installation of modular expansion joint system as indicated.

Where the modular expansion joint assembly consists of a modular, multiple seal joint system that will allow movements as shown and noted in the Plans, the configuration of the expansion joint system shall consist of preformed neoprene strip seals mechanically held in place by steel edge and separation beams. Each separation beam shall be supported by an independent support bar which is welded to the separation beam. The support bars shall be suspended over the joint opening by sliding elastomeric bearings. An equidistant control system shall be incorporated which develops its maximum compressive force when the joint is at its maximum opening. The expansion joint system shall not incorporate any bolted connections between the separator beams and support bars.

Each modular expansion joint system shall accommodate the movements and rotations as indicated.

627.2-WORKING DRAWINGS:

627.2.1-Shop Drawings: The Contractor shall submit Shop Drawings and calculations delineating the expansion joint system details and outlining installation and waterproofing schemes to the Engineer for approval prior to fabrication of the joint. The Shop Drawings and calculations shall be prepared, sealed and signed by a ~~registered~~ Professional Engineer, registered in West Virginia, and employed by the fabricator. These Shop Drawings shall include, but shall not be limited to, the following:

- A. Plan, elevation, and section of the joint system for each movement rating and roadway width. All dimensions and tolerances shall be specified.
- B. Sections showing all materials composing the expansion joint system with complete details of all individual components.
- C. All ASTM, AASHTO, or other material designations.

- D. Installation procedures including sequence, lifting mechanisms and locations, details of temporary anchorage during setting, temperature adjustment devices, opening dimensions relative to temperature, installation details at barriers, and seal installation details.
- E. Corrosion protection system.
- F. Requirements and details related to the temporary support of the joint system for shipping, handling, and job site storage.
- G. Design calculations for all structural elements including all springs and bearings. The design calculations shall include fatigue design for all structural elements, connections, and splices. All welded splices shall be shown on the Shop Drawings.
- H. Welding procedures shall be provided and shall be in accordance with the current AASHTO/AWS D1.SM/DI.F:2010 Bridge Welding Code.
- I. A written maintenance and part replacement plan to facilitate replacement of parts subject to wear. This plan shall include a list of parts, instructions for maintenance inspection, acceptable wear tolerances, methods for determining wear, procedures for replacing worn parts, and procedures for replacing seals.
- J. Any required modifications to blockout dimensions and reinforcing steel to accommodate the expansion joint system.

627.2.1.1-Certificates of Compliance:

- A. At the time of Shop Drawing submittal, the Contractor shall submit to the Engineer the following certifications for review:
 - 1. Fabricator's certificate of compliance with the AISC Quality Certification Program, Simple Bridge Category.
 - 2. Documentation that welding inspection personnel are qualified and certified as welding inspectors under AWS QC1, Standard for Qualification and Certification of Welding Inspectors.
- B. The Contractor shall submit to the Engineer the following test reports, certificates, and samples for review, within four weeks of the Shop Drawing approval:
 - 1. Fabricator's certificate of compliance for all polytetrafluoroethylene (PTFE) sheeting, PTFE fabric, and elastomer.
 - 2. Certified mill test reports for all steel and stainless steel in the expansion joint system assemblies.
 - 3. Certified test reports confirming that the springs and bearings meet the design load requirements.
- C. Acceptable Fabricators: Only fabricators whose modular expansion joint systems have met the fatigue resistance characterization requirements stipulated in Section 627.4.2.5 of this Special Provision will be permitted to supply modular expansion joint systems. Any testing required to establish the fatigue resistance of all details of a specific proprietary system shall have been completed prior to submission of shop drawings. All fatigue testing shall have been conducted in accordance with Sections 627.4.3.1 and 627.4.3.2 of this Special Provision.

The expansion joint fabricator shall have at least five years of experience in designing and manufacturing modular expansion joint systems. The Contractor shall provide written certification of the fabricator's experience to

the Engineer. This certification shall include the location of each bridge, governmental agency/owner, and the name, address, and telephone number of each owner's/agency's representative.

627.2.1.2-Warranty: The Contractor shall provide a five-year written Manufacturer's Material warranty guaranteeing the performance and durability of the expansion joint system. Conditions constituting unsatisfactory performance and durability include, but shall not be limited to, broken welds, or bolts, cracks in steel members, fatigue damage, loss of precompression in springs or bearings, debonded PTFE, breakdown of corrosion protection, and leakage. The Manufacturer shall replace or repair any expansion joint system component demonstrating unsatisfactory performance or durability within the five-year period commencing from the date of completion of the contract. All material, labor costs, and all other items need to install (including traffic control and incidentals) shall be paid by the Manufacturer.

627.3-MATERIALS:

Steel - AASHTO M270 Grade S0. Aluminum components shall not be used.

Stainless Steel - ASTM A240, Type 304

Polytetrafluoroethylene (PTFE) - The PTFE shall be virgin material in accordance with AASHTO LRFD Bridge Construction Specifications, Latest Edition, Section 18.8.1, and the following properties:

Property	Test Method	Requirements
Ultimate Tensile Strength	ASTM D638	2,800 psi
Ultimate Elongation	ASTM D638	200% min.
Specific Gravity	ASTM D792	2.10 min.
Melting Point	ASTM D4894	621°F ± 18°F

Elastomeric Seals - Seals shall be continuous without splices. They shall meet the following physical property requirements:

Physical Properties	Test Method	Requirements	
Hardness, Durometer A	ASTM D2240 modified	50-60	
Tensile Strength	ASTM D412	2,000 psi.	
Elongation at Break	ASTM D412	250% min.	
Compression Set at 70 hrs. @ 212 °F	ASTM D39S, Method B	40% max.	
Oven Aging, 70 hrs. @ 212°F	<u>ASTM</u> D573	Tensile Strength, % decrease	20 max.
		Elongation, % decrease	20 max.
		Hardness, Type A Durometer, Points change	0 to +10 max.
Oil Swell, ASTM Oil No. 3, 70 hrs. @ 212°F	<u>ASTM</u> D471	Weight change, %	45 max.
Ozone Resistance 20% strain, 300 pphm in air Modified 70 hrs. @ 105 °F	<u>ASTM</u> D1149 modified	No cracks	
Low Temp. Stiffening, 7 days @ -15 °F	<u>ASTM</u> D2240	Hardness, Type A Durometer, Points change	0 to +15
Low Temperature Test	<u>ASTM</u> D746	Not brittle	

The seal shall be a strip seal design and promote self-removal of foreign material during normal joint operation. The maximum permissible movement range for each seal is limited to 3.125 in.

Bolts, Nuts, Washers - ASTM F3125 Grade A325, Type 1, galvanized in accordance with AASHTO M 298.

Grout - Non-shrink grout in accordance with Section 715.5.

627.4-FABRICATION OF MODULAR EXPANSION SYSTEM:

627.4.1-General: The expansion joint systems shall be fabricated consistent with the details, dimensions, material specifications, and procedures delineated in the approved Shop Drawings. All fabrication procedures shall be in conformance with the Standard Specifications and the Special Provisions.

All expansion joint systems shall be fabricated by the same ~~fabricator~~ manufacturer.

When metallic attachments are used to secure elastomeric seals to center beams and edge beams, they shall be welded continuously along both the top and bottom edges.

Fabricate each modular expansion joint system as a single entity, extending continuously across the full width of the roadway, and up into the traffic barriers as indicated. Field splices will not be permitted in the modular expansion joint systems.

No bends or kinks are permitted in the modular joint system except as necessary to follow the roadway grade.

Anchors (headed studs and hook bars/stirrups) shall be inspected visually and tested in accordance with Section 7 of the AWS D1.S. Any anchor which does not have a complete end weld or does not meet these weld test requirements shall be replaced at the Contractor's expense.

The expansion joint system shall include a moveable plate system at each railing to match the shape of the adjacent concrete railing. The barrier joint system shall be fabricated of steel as defined in Section 627.3. The plates shall be designed to maintain freedom of movement that is continuous with the entire joint system. The system shall be secured.

627.4.1.1-PTFE Sliding Surfaces:

- A. All PTFE shall be bonded under controlled conditions and in strict accordance with written instructions provided by the PTFE fabricator.
- B. All PTFE surfaces shall be smooth and free of bubbles after completion of bonding operations.

627.4.1.2-Stainless Steel Sliding Surfaces:

- A. All stainless steel sliding surfaces shall have a surface finish of 20 micro inches (RMS) or less.
- B. Each stainless steel sheet shall be seal welded all around to the steel backing plate using the tungsten-arc welding process in accordance with current AWS specifications. The stainless steel sheet shall be clamped to provide full contact with the steel backing plate during welding. The seal welds shall not protrude above the sliding surface of the stainless steel sheet.

627.4.1.3-Corrosion Protection:

- A. All steel surfaces, except those surfaces beneath stainless steel sheet, those to be bonded to PTFE, or those in direct contact with elastomeric seals, shall be hot-dip galvanized per AASHTO M 111.

627.4.1.4-Shipping and Handling:

- A. The expansion joint system shall be delivered to the job site and stored in accordance with the fabricator's written requirements as approved by the Engineer.
- B. Lifting locations, lifting mechanisms, and temperature setting devices shall be shown in the Shop Drawings. Lifting mechanisms, temperature setting devices, and construction adjustment devices shall not be welded to the centerbeams or edgebeams.
- C. Damage to the expansion joint system during shipping or handling shall be just cause for rejection of the expansion joint system.
- D. Damage to the corrosion protection system shall be repaired to the satisfaction of the Engineer.

627.4.2-Design Requirements:

627.4.2.1-General:

- A. The expansion joint system shall be designed and detailed to permit access to the underside of the installed system for inspection and maintenance activities.
- B. The expansion joint system shall be designed and detailed to minimize concrete cracking above the support boxes. Measures taken shall include, but not be limited to, assuring adequate support box top plate thickness, specifying any additional deck slab steel reinforcement required, and providing adequate concrete cover.
- C. The expansion joint system and steel deck reinforcement shall be detailed to assure that adequate concrete consolidation can be achieved around all support boxes.
- D. The expansion joint seals shall not protrude above the top of the expansion joint system. Split extrusions may be used at upturns at all barriers.
- E. The elastomeric or urethane springs and bearings shall be designed to be removable and replaceable. The removal and reinstallation of the expansion joint seal shall be easily accomplished from above the joint. These operations shall be viable with one lane partial closure of the roadway.
- F. The expansion joint system shall be designed and detailed to be watertight.
- G. The expansion joint system shall be designed and detailed to account for the effects of all translations, in addition to the superelevation and longitudinal profile of the roadway.

627.4.2.2-Design Axle Loads and Impact Factors:

- A. The centerbeams, support bars, bearings, connections, and other structural components shall be designed for the simultaneous application of vertical and horizontal loads from a tandem axle. The tandem axle shall consist of a pair of axles spaced 4 ft. apart with vertical and horizontal loads as specified in Sections 627.4.2.2 B, C, D, and E of this Special Provision. The transverse spacing of the wheels shall be 6 ft. The distribution of the wheel load among centerbeams shall be as stipulated in Section 627.4.2.3 of this Special Provision.
- B. The vertical load range for fatigue design shall be 32 kips tandem. This tandem shall be taken as two 16 kips axles spaced 4 ft. apart. Only one of these tandem axles must be considered in the design, unless the joint opening exceeds 4 ft. The load range shall be increased by the dynamic load allowance (Impact Factor) of 75%. Load factors shall be applied in accordance with Table 3.4.1-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition.
- C. The vertical load for strength design shall be 50 kips tandem. This tandem shall be taken as two 25 kips axles spaced 4 ft. apart. Only one of these tandem axles must be considered in the design, unless the joint opening exceeds 4 ft. This load shall be increased by the dynamic load allowance (Impact Factor) of 75%. Load factors shall be applied in accordance with Table 3.4.1-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition.
- D. The horizontal load range for fatigue design shall be 20% of the amplified vertical load range (LL+IM) specified in Section 627.4.2.2B of this Special

Provision. For modular expansion joint systems installed at locations where significant braking and/or acceleration forces are expected, the horizontal load range for fatigue design shall be 50% of the amplified vertical load range (LL + IM).

For modular expansion joint systems installed on vertical grades in excess of 5%, the horizontal component of the amplified vertical load range (LL+IM) specified in Section 627.4.2.2B of this Special Provision shall be added to this horizontal load range.

- E. The horizontal load for strength design shall be 20% of the amplified vertical load (LL+IM) specified in Section 627.4.2.2C of this Special Provision. For modular expansion joint systems installed at locations where significant braking and/or acceleration forces are expected, the horizontal load for strength design shall be 50% of the amplified vertical load (LL + IM).

For modular expansion joint systems installed on vertical grades in excess of 5%, the horizontal component of the amplified vertical load (LL+IM) specified in Section 627.4.2.2C of this Special Provision shall be added to this horizontal load.

627.4.2.3-Distribution of Wheel Loads: The following table specifies the centerbeam distribution factor as a function of centerbeam top flange width. This factor is the percentage of the design vertical axle load and the design horizontal axle load which shall be applied to an individual centerbeam for the design of that centerbeam and its associated support bars.

Distribution factors shall be interpolated for centerbeam top flange widths between those explicitly denoted in the table. In no case shall the distribution factor be taken as less than 50%. The remainder of the load shall be divided equally and applied to the two adjacent centerbeams or edge beams.

Width of Centerbeam Top Flange	Distribution Factor
2.5 in.	50%
3.0 in.	60%
4.0 in.	70%
4.5 in.	80%

627.4.2.4-Fatigue Limit State Design Requirements:

- A. Modular expansion joint system structural members, connections (bolted and welded), splices, and attachments shall be designed to resist the Fatigue Limit State load combination specified in Table 3.4.1-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition. The vertical and horizontal load ranges specified in Section 627.4.2.2 of this Special Provision shall be applied simultaneously. These loads shall be distributed as specified in Section 627.4.2.3 of this Special Provision.
- B. The nominal stress ranges, Δf , at all fatigue critical details shall be obtained from a structural analysis of the expansion joint system applying the design vertical and horizontal load ranges specified in Section 627.4.2.2 of this Special Provision, and distributed as specified in Section 627.4.2.3 of this Special Provision.

The expansion joint system shall be analyzed with a minimum gap opening corresponding to the midrange configuration (at least half of the maximum gap opening). The design axle load shall be applied as two wheel loads, each having a transverse width of 20 in. For each detail under consideration, the wheel loads shall be positioned transversely on a centerbeam to achieve the maximum nominal stress range at that detail. The vertical and horizontal wheel loads shall be applied as line loads to the top of the centerbeams at their centerlines.

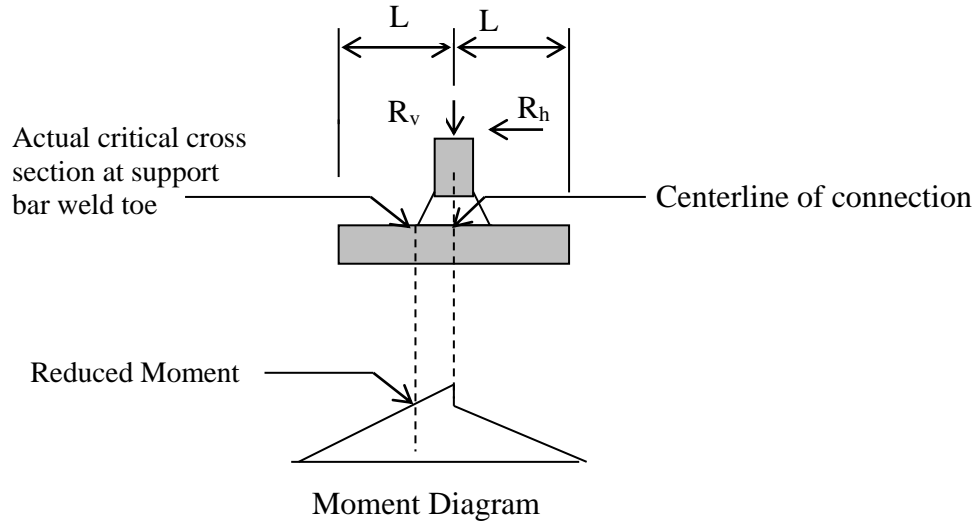
The design stress range in the centerbeam-to-support bar connection shall be calculated according to Sections 1 and 2 below. The design nominal stress ranges, Δf , shall be used for fatigue design as specified in Section 627.4.2.4C of this Special Provision.

1. Welded or Bolted Single-Support Bar Systems

- a) The nominal stress range, Δf , in the centerbeam at a welded or bolted stirrup shall be the sum of the longitudinal bending stress ranges at the critical section resulting from vertical and horizontal loading. The effects of stresses in any load-bearing attachments such as the stirrup or yoke shall not be considered when calculating the longitudinal stress range in the centerbeam. For bolted single-support-bar systems, stress ranges shall be calculated using the net section.
- b) The nominal stress range, Δf , in the stirrup or yoke shall be calculated without considering the effects of stresses in the centerbeam. The stress range shall be calculated by assuming a load range in the stirrup equal to 30% of the total vertical reaction force between the centerbeam and the support bar. The effects of horizontal loads may be neglected in the design of the stirrup.

2. Welded Multiple-Support Bar Systems

Three locations have been identified as initiation sites for fatigue cracking at a centerbeam-to-support bar welded connection. The types of cracking associated with these three locations are described below. The corresponding equations may be used to calculate the nominal stress range, Δf . For the support bar, either the reduced moment at the critical cross section or the moment at the centerline of the connection may be used in these equations.



- a) Centerbeam weld toe cracking is driven by a combination of vertical and horizontal (longitudinal) bending stress range, S_{RB} , in the centerbeam, and vertical stress range, S_{RZ} , at the top of the connection weld.

The vertical and horizontal (longitudinal) bending stress range, S_{RB} , at the bottom of the centerbeam shall be calculated as:

$$S_{RB} = \frac{M_{Vcb}}{S_{Xcb}} + \frac{M_{Hcb}}{S_{Ycb}}$$

The vertical stress range, S_{RZ} , at the top of the connection weld shall be calculated as:

$$S_{RZ} = \frac{R_H d_{cb}}{S_{Wtop}} + \frac{R_V}{A_{Wtop}}$$

- b) Support bar weld toe cracking is driven by a combination of vertical and horizontal (longitudinal) bending stress range, S_{RB} , in the support bar and vertical stress range, S_{RZ} , at the bottom of the connection weld.

The vertical and horizontal (longitudinal) bending stress range, S_{RB} , at the top of the support bar shall be calculated as:

$$S_{RB} = \frac{M_{Vsb}}{S_{Xsb}} + \frac{1}{2} \frac{R_H (d_{cb} + h_w + 0.5 d_{sb})}{S_{Xsb}}$$

The vertical stress range, S_{RZ} , at bottom of the connection weld shall be calculated as:

$$S_{RZ} = \frac{R_H (D_{cb} + H_w)}{S_{wbot}} + \frac{R_V}{A_{wbot}}$$

- c) Weld throat cracking is driven by a vertical stress range at the weld throat.

The vertical stress range, S_{RZ} , at mid-height of the connection weld shall be calculated as:

$$S_{RZ} = \frac{R_V}{A_{Wmid}} + \frac{R_H (d_{cb} + 0.5 h_w)}{S_{Wmid}}$$

In the above equations:

R_V	Vertical reaction at the connection weld
R_H	Horizontal reaction at the connection weld
M_{Vcb}	Bending moment in the centerbeam due to applied vertical
b	Bending moment in the centerbeam due to applied horizontal
M_{Vsb}	Bending moment in the support bar due to applied vertical
S_{xcb}	Section modulus at bottom of the centerbeam about horizontal
S_{ycb}	Section modulus of the centerbeam about vertical axis
S_{xsb}	Section modulus at top of the support bar about horizontal axis
A_{wtop}	Area of the weld at the top of the connection
A_{wmid}	Area of the weld at the middle of the connection
A_{wbot}	Area of the weld at the bottom of the connection
S_{wtop}	Section modulus of the weld at the top of the connection
S_{wmid}	Section modulus of the weld at the middle of the connection
S_{wbot}	Section of the modulus of the weld at the bottom of the
H_w	Connection Height of the weld
D_{cb}	Depth of the centerbeam
D_{sb}	Depth of the support bar

The nominal stress range, Δf , at welded multiple-support-bar connection details shall be calculated for each case above as follows:

$$\Delta f = \sqrt{S_{RB}^2 + S_{RZ}^2}$$

Where:

S_{RB} = vertical and horizontal (longitudinal) stress range in the centerbeam or support bar, as calculated for each specific case above

S_{RZ} = vertical stress range in the centerbeam-to-support bar connection weld, as calculated for each specific case above

- C. To ensure an infinite fatigue life, all modular expansion joint system structural members, connections (bolted and welded), splices, and attachments shall satisfy the following:

$$\Delta f \leq \frac{F_{TH}}{2}$$

Where:

Δf = the nominal stress range as specified in Section 627.4.2.4 B of this Special Provision

F_{TH} = constant amplitude fatigue threshold (CAFL) as specified in Section 627.4.3.S of this Special Provision

627.4.2.5-Fatigue Resistance of Details: The fatigue resistance of details shall be characterized in terms of the fatigue categories specified in Table 6.6.1.2.S-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition. Many details composing modular expansion joint systems may clearly correspond to specific structural details depicted in Figure 6.6.1.2.3-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition. In these cases, the applicable fatigue categories specified in Table 6.6.1.2.S-1 may be used for design. In cases where a detail does not clearly correspond to a structural detail depicted in Figure 6.6.1.2.3-1, fatigue testing shall be conducted, in accordance with Sections 627.4.3.1 and 627.4.3.2 of this Special Provision, to establish the appropriate constant amplitude fatigue limit (CAFL) for that detail.

627.4.2.6-Strength-I Limit State Design Requirements: Modular expansion joint system structural steel members, connections (bolted and welded), splices, and attachments shall be designed to resist the Strength-I Limit State load combination specified in Table 3.4.1-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition. The vertical and horizontal loads specified in Section 627.4.2.2 of this Special Provision shall be applied simultaneously. These loads shall be distributed as specified in Section 627.4.2.3 of this Special Provision.

627.4.3-FATIGUE TESTING REQUIREMENTS:

627.4.3.1-Fatigue Testing of Metallic Structural Components and Connections:

A. Methodology

1. This test procedure is acceptable for, and specifically applicable to, establishing the fatigue resistance of the centerbeam-to-support bar connection in modular expansion joint systems. It is applicable to single-support-bar and multiple-support bar systems having either welded or bolted centerbeam-to-support bar connections. The same methodology may be applied to establish the fatigue resistance of other modular expansion joint metallic structural component details, including centerbeam splices.
2. Each fatigue test generates a discrete datum. Each datum comprises an applied constant amplitude nominal stress range, S_r , and the corresponding number of cycles, N , associated with either a predetermined extent of crack propagation, defined as failure, or with termination of the test,

defined as runout. Ten reportable fatigue cracks (data) shall be acquired for each connection detail. All data shall be in the very long life range, corresponding as closely to the constant amplitude fatigue limit (CAFL) as practical. Specifically, the number of cycles, N , associated with each datum, shall be no less than one order of magnitude less than N_{\min} corresponding to the detail category specific CAFL specified in Section 627.4.3.1G.1 of this Special Provision. For example, to characterize a detail as Detail Category C, the tested number of cycles, N , shall exceed 4.4×10^5 for each datum.

3. The constant amplitude nominal stress range shall be calculated at the anticipated initiation location of an incipient crack. Nominal stresses shall be calculated using conventional equations for analyzing bending and axial load. These equations are essentially the same as those used in strength design. The stress concentration effects of a weld, bolt hole, or other local features are not explicitly embodied in the conventional nominal stress equations.
4. The appropriate AASHTO detail category applicable to fatigue design shall be established by comparing acquired test data to fatigue resistance graphs representing the AASHTO detail categories. The constant amplitude fatigue limit (CAFL) applicable to fatigue design corresponds to the AASHTO detail category fatigue resistance graph representing a lower bound of the experimentally acquired data.
5. When testing is conducted exclusively in the infinite life regime and more stringent test data scatter requirements are satisfied, a unique CAFL (different from those CAFL corresponding to specific detail categories specified by AASHTO) may be established for fatigue design.

B. Specimens

1. Specimens selected for testing shall be full-scale centerbeam and support bar assemblies or subassemblies representative of those installed in field applications. A subassembly is defined as a specimen having the same physical and geometric properties as an assembly but having a reduced number of centerbeams.
2. Each specimen shall consist of three continuous centerbeam spans over four equally spaced support bars. Centerbeam spans between adjacent support bar centerlines shall be a minimum of 3.0 ft. and a maximum of 4.0 ft. Support bar spans shall be a minimum of 3.0 ft. and a maximum of 3.67 ft. The centerbeam-to-support bar connection being tested shall be located at the midspan of each support bar.
3. Any welded or bolted attachments used to secure equidistant springs to a support bar, centerbeam, or stirrup shall be fabricated as an integral part of the specimen. A load path (rigid support fixed to the test fixture) shall be provided to resist any horizontal forces or displacements which would normally be resisted through these attachments in a field installation. Any miscellaneous welded or bolted attachments, including welded attachments used to secure the expansion joint elastomeric seals to the centerbeams, shall also be fabricated as integral parts of the specimen.

4. Support bars of subassembly specimens that are components of single-support-bar swivel-joist type modular expansion joint systems shall be oriented perpendicular to the longitudinal axis of the centerbeam.
5. Prior to testing, each specimen shall be visually inspected for any defects, loose fasteners or other aberrations which could affect the tested fatigue resistance. Defects and flaws shall be defined in accordance with the appropriate governing specification (ASTM A-6, AWS D1.S, etc.). Data acquired from specimens containing such defects shall not be excluded from consideration except as permitted in Section 627.4.3.1G.2.c of this Special Provision. Any observed defect shall also be reported with its corresponding data in the tabular format stipulated in Section 627.4.3.1H of this Special Provision.

C. Instrumentation

1. Each specimen shall be sufficiently instrumented to measure the static nominal strain range within that specimen for a specific applied load range. Best results can generally be obtained when the applied load range for the static calibration tests does not pass through zero load. Strain measurements shall be made at locations sufficiently distant from local effects, such as weld toes or bolt holes, which could significantly influence acquired test data.
2. As a minimum, eight strain gages shall be installed on the centerbeam top flange in the vicinity of each centerbeam-to-support bar connection. These gages shall be installed in pairs on each side of the connection at distances of one and two times the depth of the centerbeam from the centerline of the connection. Each pair of strain gages shall be located symmetrically about the centerline of the centerbeam. As a minimum, two strain gages shall also be installed on the support bar bottom flange in the vicinity of each centerbeam-to-support bar connection. One of these strain gages shall be installed on each side of the connection at a distance equal to the depth of the support bar from the centerline of the connection. These strain gages shall be installed along the centerline of the supportbar.

D. Test Fixtures

1. Test fixtures shall have the capability to adequately support and secure the specimen throughout the duration of the test. The fixture shall be designed and fabricated to such tolerances as required to assure that additional stresses will not be generated in the specimen as a consequence of fixture misalignment. Mismatches resulting from specimen fabrication errors shall be accommodated by shimming or other such means precluding the application of force to the specimen.
2. Typical elastomeric bearings and springs used to transfer vertical loads from the support bars to the support boxes may be replaced with steel bearings in the test fixture. This modification will enable fatigue testing at higher load ranges and different frequencies than those encountered during normal service conditions.
3. Load shall be applied through two 10 in. long patches. Each patch shall typically comprise a steel plate and a hard rubber bearing pad placed in contact with the bottom flange of the centerbeam. Each patch shall be

located at the midspan of each outer span.

4. In order to assure adequate seating of the specimen in the test fixture, a minimum of 10 kips shall be applied at each patch location. This requirement is waived for tests of single support bar systems conducted using load reversal. Once this load has been applied, all strain measuring devices shall be rebalanced to zero strain while the preload is maintained. An additional load approximately equivalent to the calculated load range shall be applied. Strain ranges shall be measured for the load range from 10 kips to the peak load. Each static calibration test shall be repeated three times while still maintaining a minimum 10 kips load at each load patch. The measured strain ranges from each repetition should vary by no more than 25% from the mean value. If the stress ranges are not repeatable, appropriate modifications shall be made to the test fixture until the strain ranges are repeatable.

E. Static Calibration Test

1. Prior to any fatigue resistance testing, a static calibration test shall be performed in order to validate the structural analysis model. The static calibration test shall be performed after attainment of stress range repeatability as described in Section 627.4.3.1D.4 of this Special Provision. The structural analysis model shall be considered validated when calculated strain ranges are within +25% of the measured strain ranges at every strain gage location.
2. For the purpose of reporting nominal fatigue resistance stress ranges at specific details, stress ranges determined through structural analysis of the model shall be preferred over stress ranges acquired directly from test measurements.

F. Test Procedures

1. A minimum of ten data points shall be required to establish the fatigue resistance of each detail. The centerbeam-to-support bar connection shall be considered as a single detail.
2. Several data points may be obtained from a single specimen by repairing the cracked sections of that specimen and resuming testing. Such repairs shall have minimal effect on the stress ranges at unfailed details still being tested. Data points derived from tests in which a repaired detail cracks again shall be discarded.
3. All data shall be in the very long life range, corresponding as closely to the constant amplitude fatigue limit as practical, but in no case less than 200,000 cycles. Either finite life regime or infinite life regime testing may be conducted. For infinite life regime testing, the number of cycles, N , associated with each of the ten data shall be at least twice the number of cycles, N_{min} , designated in the table in Section 627.4.3.1G.1 of this Special Provision.
4. Loads shall be applied using hydraulic actuators or other similar loading devices. The magnitude of the vertical load range, ΔP_v , shall be maintained and continuously monitored throughout the duration of the

test. Vertical and horizontal load ranges shall be applied to the specimen simultaneously. The horizontal load range shall always be equal to 20% of the vertical load range, $\pm \Delta P_v$. This horizontal-to-vertical load ratio may be obtained by inclining the specimen 11.3 degrees with respect to the horizontal plane and applying load through vertically oriented actuators.

5. For multiple support bar systems, the loading mechanism shall be either exclusively tension or exclusively compression and shall be applied at a constant amplitude at any desired frequency. The applied load range shall be in a direction such that the reaction force between the centerbeam and support is always tensile. The load range shall not pass through zero load. Minimum preload shall be maintained throughout the duration of the test.
6. Single support bar systems may be loaded using the same procedures as those for multiple support bar systems. If premature stirrup failure occurs, an applied load range of 70% downward and 30% uplift may be used.
7. The load ranges used in the test shall not be so large as to alter the observed failure mode from that which would be observed under service conditions. Under no circumstance shall imposed stress exceed the yield stress of the material in any portion of the specimen. Each specimen shall be tested using at least two different load (stress) ranges.
8. If infinite life regime testing is conducted, the first load range should be chosen so that the applied stress range is just above the postulated CAFL. The load range in the subsequent test shall be decreased if failure resulted and increased if the test resulted in a runout. A suggested increment in load is such that the stress range is increased or decreased by 2 ksi. The applicable CAFL must be selected from those CAFL values corresponding to the AASHTO fatigue categories. The selected CAFL is the one just below the lowest stress range that resulted in cracking.
9. The following criteria shall be used to define failure of a given centerbeam-to-support bar connection:
 - a. Welded Centerbeam-to-Support Bar Connections
 - i. *Centerbeam weld toe cracking* originates at or near the centerbeam weld toe, propagates up into the centerbeam at some angle, and grows back over the connection. These cracks typically grow at an angle of about 45 degrees. A specimen shall be considered as failed due to this type of cracking when the crack has grown on any vertical face a length from the point of origin equal to half of the centerbeam depth.
 - ii. *Support bar weld toe cracking* originates at or near the support bar weld toe, propagates down into the support bar, and grows back under the connection at some angle, typically about 45 degrees. A specimen shall be considered as failed due to this type of cracking when the crack has grown on any vertical support bar face a length from the point of origin equal to half of the depth of the support bar.
 - iii. *Weld throat cracking* originates in the weld throat and typically grows in a plane parallel to the longitudinal axis of the support bar at about mid-depth of the weld throat. A specimen shall be

considered as failed due to this type of cracking when a complete fracture of the weld throat has occurred. These cracks have been observed to turn down into the support bar, but only after significant growth. In such instances, the criteria for support bar weld toe cracking shall be applied.

b. Welded Stirrup Connections

A specimen shall be considered as failed when cracks result in the complete fracture of any stirrup leg, or when cracks originating at or near a stirrup weld have grown into any face of the centerbeam a length from the stirrup weld toe equal to half of the centerbeam depth.

c. Bolted Centerbeam-to-Support Bar Connections

A specimen shall be considered as failed when:

- i. Fatigue cracks which have grown out of a bolt hole have resulted in the complete fracture of the tension flange of the centerbeam.
- ii. Fatigue cracks which have grown out of a bolt hole have extended into any face of the centerbeam web a distance equivalent to half of the centerbeam depth less the centerbeam flange thickness.
- iii. Any portion of a stirrup fractures completely.
- iv. Any single bolt fractures completely.

10. Alternate Criteria for Termination of a Finite Life Regime Test

A test may also be terminated when, for a given stress range, the specimen has survived the number of cycles required to plot the data above either a particular fatigue resistance curve or the maximum permitted in Section 627.4.3.1G.2.d of this Special Provision. For example, if the applied stress range is 17 ksi and the desired fatigue resistance curve is Category C, then based upon the equation presented in Section 627.4.3.1G.1 of this Special Provision, the test may be terminated after application of about 900,000 cycles provided that the specimen has not failed based on the above described criteria.

11. Nominal Stress Range Calculation

a. Welded Centerbeam-to-Support Bar Systems

- i. The nominal stress range for centerbeam weld toe cracking shall be calculated by taking the square root of the sum of the squares of the horizontal bending stress range in the centerbeam and the vertical stress range at the top of the weld.
- ii. The nominal stress range for support bar weld toe cracking shall be calculated by taking the square root of the sum of the squares of the longitudinal bending stress range in the support bar and the vertical stress range at the bottom of the weld.
- iii. The nominal stress range for weld throat cracking shall be the calculated vertical stress range in the throat of the weld.
- iv. The nominal stress range in the centerbeam at a welded stirrup shall be calculated as the summation of the longitudinal bending stress ranges at the critical section resulting from vertical and horizontal loading. The entire load range shall be used in the calculation, even if the loading is partly in compression. The

effects of stresses in any load-bearing attachments such as the stirrup or yoke shall not be considered when calculating the nominal stress range in the centerbeam. The load range in the stirrup itself shall be taken as 30% of the total vertical load range carried through the connection. The effect of horizontal forces may be neglected.

b. Bolted Systems

- i. The nominal stress range in the centerbeam shall be taken as the summation of the longitudinal bending stress ranges in the centerbeam resulting from vertical and horizontal loading. Nominal stress ranges shall be calculated using the net section. The effects of stresses in the stirrup shall not be considered when calculating the nominal stress range in the centerbeam.
- ii. The nominal load range in the bolt group and the stirrup assembly shall be taken as 30% of the total vertical load range carried through the connection. The effect of horizontal forces may be neglected.

G. Interpretation of Test Data

1. The experimentally acquired data (cycles to failure, N, and applied constant-amplitude nominal stress range, S_r) and graphs representing the fatigue resistance of the detail categories delineated in Section 6.6 of the AASHTO LRFD Bridge Design Specifications - Latest Edition shall be plotted on a log-log scale. The data are associated with the greatest S-N curve which represents a lower bound to the data. The equation representing the finite life fatigue resistance of these AASHTO detail categories is:

$$N = \frac{A}{(S_{r,eff})^3}$$

where:

N number of cycles to failure

$S_{r,eff}$ nominal effective stress range at the detail under consideration

A constant defined in Table 6.6.1.2.S-1 of the AASHTO LRFD Bridge Design Specifications - Latest Edition

The minimum number of cycles associated with infinite fatigue life, N_{min} , and the corresponding constant amplitude fatigue limit (CAFL) for each AASHTO detail category is designated in the table below.

Detail Category	N_{min} (infinite fatigue life)	CAFL (ksi)
A	1.8×10^6 cycles	24.0
B	3.0×10^6 cycles	16.0
B'	3.5×10^6 cycles	12.0
C	4.4×10^6 cycles	10.0
C'	2.5×10^6 cycles	12.0

D	6.4×10^6 cycles	7.0
E	1.2×10^7 cycles	4.S
E'	2.2×10^7 cycles	2.6

2. Finite Life Regime Testing

- The number of cycles, N , to either failure or runout, associated with each of the ten data need not exceed N_{min} , designated in the table in Section 627.4.3.1G.1 of this Special Provision.
- The detail category applicable to fatigue design shall be that corresponding to the highest of the AASHTO detail category fatigue resistance graphs representing a lower bound of all ten experimentally acquired data, except as limited in the table in Section 627.4.3.1G.2.d.
- If all but one data point falls above a selected AASHTO S-N curve, that one data point may be discarded and replaced by three new data obtained through additional testing. The additional testing shall be conducted using the same stress range as that of the discarded datum. The three additional data shall be plotted along with the remaining nine data. The applicable detail category shall be that corresponding to the highest of the AASHTO detail category fatigue resistance graphs representing a lower bound of all twelve data, except as limited in the table in Section 627.4.3.1G.2.d. For any detail, only one data may be discarded and subsequently replaced three additional data for any set of ten original data. None of the additional data, if obtained, shall be discarded.
- The maximum fatigue resistance of any detail shall not exceed that associated with the fatigue category prescribed in the table below.

Type of Detail	Maximum Permitted Category ³
Welded Multiple Centerbeam-to-Support Bar Connections	C
Welded Stirrup Attachments for Single Support Bar Systems	B
Bolted Stirrup Attachments for Single Support Bar Systems	D
Groove Welded Centerbeam Splices ¹	C
Miscellaneous Welded Connections ²	C
Miscellaneous Bolted Connections	D

1 Groove-welded full-penetration splices may be increased to Category B if weld integrity is verified using non-destructive testing (NDT).

2 Miscellaneous connections include attachments for equidistant devices.

3 The maximum permitted category applies only to the S-N curve at stress ranges above the CAFL. A CAFL that is higher than the CAFL associated with these categories may be used if the CAFL is established with a minimum of ten test data.

- The fatigue resistance for stirrups welded to a centerbeam flange shall not be taken greater than that defined using the fatigue details defined in Section 6.6 of the AASHTO LRFD Bridge Design Specifications-Latest Edition. The fatigue resistance of the centerbeam is similar to and shall be considered as a "Longitudinally Loaded Groove-Welded Attachment" or a "Longitudinally Loaded Fillet-Welded Attachment",

depending on the type of connection used. The fatigue resistance of the stirrup is similar to and shall be considered as a "Transversely Loaded Groove-Welded Attachment" or a "Transversely Loaded Fillet-Welded Attachment", depending on the type of connection used.

3. Infinite Life Regime Testing

- a. The applicable constant amplitude fatigue limit (CAFL) for fatigue design may be selected as the highest CAFL of the AASHTO detail categories representing a lower bound to the experimentally acquired data. The CAFL of the AASHTO detail categories are designated in the table in Section 627.4.3.1G.1 of this Special Provision.
- b. A unique CAFL (different from the CAFL categories delineated in Section 6.6 of the AASHTO LRFD Bridge Design Specifications - Latest Edition) may be established if all ten data are within 4 ksi of that unique CAFL.

H. Data Reporting

1. Fatigue Test Results and Observations

Data shall be reported in the typical S-N format (logarithm(S) vs. logarithm(N)) with the log of the stress range plotted as the ordinate (y-axis). Additionally, the data shall be reported in tabular format. The table shall contain the following information:

- a. Nominal stress range at the specific detail, $S_{r,eff}$
- b. Applied load range for each patch
- c. Number of cycles at initial observation of cracking (for reporting purposes only, not included as S-N data)
- d. Number of cycles at failure or termination of the test, N, and the reason for stopping the test (failure or termination)
- e. Type of crack as described in Section 627.4.3.1F.9 of this Special Provision. A detailed description of the fatigue crack shall be provided if the observed crack does not resemble any of the crack types described in Section 627.4.3.1F.9 of this Special Provision

2. Miscellaneous Required Information

The following information shall also be reported:

- a. Expansion joint system type and fabricator
- b. Drawing depicting shape, size, and dimensions of the specimen
- c. Drawings depicting fixture details, including specimen orientation
- d. Section properties and dimension of the centerbeam and support bar
- e. Centerbeam-to-support bar connection details
 - i. Weld procedure specifications for welded expansion joint systems
 - ii. Bolt size, material specifications, location, and method of tightening for bolted expansion joint systems.

627.4.3.2-Durability Testing of Elastomeric Support Bearings:

A. Scope

1. This section provides guidelines for durability testing of the elastomeric support bearings typically used in modular expansion joint systems. It is not applicable to compression springs, equidistant springs, or other

elastomeric components.

2. Tests shall be performed dynamically on individual bearings. Fatigue life is evaluated by applying a displacement range to each specimen rather than a load or stress range.

B. Specimens

1. Specimens shall comprise full-scale bearing components representative of those installed in field applications. PTFE sliding surfaces or materials typically bonded to the elastomeric support bearings shall be fabricated as an integral part of the specimen.
2. Prior to testing, each specimen shall be visually inspected for any flaws or defects that could plausibly affect fatigue resistance. Any flaws or details shall be defined and recorded. Data obtained from specimens containing such anomalies shall not be excluded from the data set. Observed anomalies shall also be reported with the test data.

C. Test Fixtures

Test fixtures shall have the capability to adequately support and secure the specimen throughout the duration of the test. The fixture shall be designed and fabricated to such tolerances as required to assure that additional stresses will not be generated in the specimen as a consequence of fixture misalignment.

D. Loading Details

1. Loads shall be applied through hydraulic actuators or other similar loading devices. Fatigue testing shall be performed using displacement control. Displacement and load ranges shall be continuously monitored throughout the duration of the fatigue test to assure that desired displacement range and minimum preload are maintained.
2. Load shall be applied to the specimen through flat steel plates that are smooth and free of surface corrosion. These plates shall be sufficiently thick to assure even load distribution to the specimen.

E. Dynamic Stiffness Test

1. Testing shall be conducted on each specimen to be subjected to fatigue testing in order to establish its dynamic stiffness for at least three different loading frequencies. The maximum of these loading frequencies shall be equal to the service load frequency corresponding to a vehicle traveling at 60 mph. The loading frequency, f , shall be calculated as:

$$f = \frac{V}{2(g + b)}$$

where:

- V vehicle speed (60 mph at service load)
- g centerbeam gap (assume mid-range configuration)
- b centerbeam width

2. The load range applied during the dynamic stiffness test shall be that obtained from structural analysis using fatigue wheel loads and wheel load distribution factors as specified in Section 627.4.2.2 and Section 627.4.2.3 of this Special Provision.
3. Each dynamic stiffness test shall be performed three times. Data from individual tests shall be compared to assure consistency of test results.

F. Fatigue Test

1. A minimum of three fatigue tests shall be required to establish the durability of each type of bearing.
2. The fatigue test shall be conducted using displacement control. The displacement (strain) range shall be applied using a sine or other smooth waveform at any frequency less than or equal to the service load frequency calculated in Section 627.4.3.2E of this Special Provision. The magnitude of the applied displacement amplitude, Δ , shall be calculated as:

$$\Delta = \frac{R_v}{K}$$

Where:

R_v = vertical reaction force at the support bearing as obtained from structural analysis

K = dynamic stiffness of the support bearing as determined in Section 627.4.3.2E of this Special Provision.

3. A minimum precompression strain shall be maintained in the specimen throughout the duration of the test. This precompression strain shall be approximately equal to that present in a support bearing in a field installation. The magnitude of the applied cyclic strain shall be at least equal to the precompression strain.
4. The minimum and maximum dynamic load shall be recorded at the beginning of the test. The minimum and maximum dynamic load shall be monitored and periodically recorded throughout the duration of the test.
5. At the end of each applied displacement cycle, the displacement shall be held at the precompression level for no less than one half of the period of loading in order to facilitate heat dissipation. Artificial air flow devices (electrical fans) may be used to assist heat dissipation. Excessive heat generation will adversely affect the tested fatigue life.
5. A specimen shall be accepted as having passed the fatigue test criteria after withstanding 2 million cycles of loading without failure.
6. The following criteria shall constitute failure:
 - a. The elastomeric material exhibits excessive deterioration or cracking.
 - b. The measured minimum dynamic load falls to 30% of the initial dynamic load recorded at test initiation.
 - c. The measured dynamic load range decreased to half of the initial dynamic load range recorded at test initiation.

G. Data Reporting for Fatigue Test

1. Data shall be reported in tabular format and shall contain the following information for each specimen tested:
 - a. Minimum (precompression) strain, maximum strain, displacement, and load at test initiation
 - b. Type of loading impulse (sine wave, ramp, etc.)
 - c. Number of cycles at initial observation of distress leading to failure (for reporting purposes only, not to be included in the data)
 - d. Number of cycles at failure
 - e. A description of the mode of failure

2. The following data shall also be reported for each specimen tested:
 - a. Bearing type and fabricator
 - b. Drawings depicting shape, size, and dimensions of the specimen including any PTFE sliding surfaces or materials bonded to the specimen
 - c. Drawings depicting fixture details, including specimen orientation

627.6.9-Installation: The fabricator of the expansion joint system shall provide a qualified installation technician to be on site during installation of the expansion joint devices to assure their proper installation. This technician shall be a full time employee of the fabricator of the specific expansion joint system being installed. The Contractor shall comply with all recommendations made by the expansion joint fabricator's installation technician as approved by the Engineer. Each expansion joint system fabricator's installation technician shall certify to the Engineer that the approved installation procedures were followed. All certifications to the Engineer shall be in writing and shall be signed and dated by the fabricator's installation technician.

Each expansion joint system shall be installed in strict accordance with the fabricator's approved Shop Drawings, the Contract Drawings, and the recommendations of the fabricator's installation technician.

Each permanently installed expansion joint system shall match exactly the finished roadway profile and grades. In order to perform the work of installing the joint system in a proper manner, some portions of the slab, barrier and abutment cannot be constructed until after the joint system is installed. Once the expansion joint system has been installed to the proper profile and grade, install non-shrink grout under all support boxes in accordance with the grout fabricator's recommendations.

Each expansion joint system shall be tested for watertightness after installation in accordance with Section 627.6.9.1 of this Special Provision. Leaks shall be repaired to the satisfaction of the Engineer.

The Contractor shall exercise care at all times to protect each expansion joint system from damage. The Contractor shall protect concrete blockouts and supporting systems from damage and construction traffic prior to installation of the expansion joint systems. After installation, construction loads shall not be allowed on the expansion joint systems. The Contractor shall submit to the Engineer for approval a proposed method of bridging over each expansion joint system to accommodate any construction traffic.

Each expansion joint system shall be set to a gap width corresponding to the ambient temperature at the time of setting. This information is specified in the Contract Drawings and shall also be specified on the approved Shop Drawings. Any mechanical devices supplied by the joint system fabricator, for the purpose of setting the expansion joint system to the proper gap width, will remain the property of the fabricator. When no longer required, the devices shall be returned to the fabricator.

All forms and debris that may impede movement of the expansion joint systems shall be removed.

627.6.9.1-Watertightness: The Contractor shall flood each completely installed expansion joint system to a minimum depth of 3 in. for a duration of at least one hour. If leakage is observed, the expansion joint system shall be repaired at the Contractor's expense. The repair procedure shall be prepared by the expansion joint system fabricator

and shall be submitted to the Engineer for approval. After repairs are completed, the expansion joint shall be retested for leakage.

627.6.9.2-Inspection: Each expansion joint system shall be subjected to and shall pass three levels of inspection in order to be accepted. These three levels are *Quality Control Inspection*, *Quality Assurance Inspection*, and *Final Inspection*. The fabricator shall provide both *Quality Control Inspection* and *Quality Assurance Inspection*. The Contractor shall provide access to the Engineer for the *Final Inspection*.

- A. *Quality Control Inspection* shall be provided by the fabricator on a full time basis during the fabrication process of all major components to assure that the materials and workmanship meet or exceed the minimum requirements of the Contract. *Quality Control Inspection* shall be performed by an entity having a line of responsibility distinctly different from that of the fabricator's fabrication department.
- B. *Quality Assurance Inspection* shall be performed by an agency appointed by the Engineer.
- C. *Final Inspection* of each expansion joint system shall be performed by the Engineer at the job site immediately prior to installation. The Contractor shall provide an accessible work area for this inspection. During *Final Inspection*, the Engineer shall inspect each expansion joint system for proper alignment, complete bond between expansion joint elastomeric seals and steel components, and proper steel stud placement. There shall be no bends or kinks in the steel components, except as required to follow roadway grades and as specifically detailed on the approved Shop Drawings. Straightening of unintended ends or kinks shall not be permitted. Any expansion joint system exhibiting bends or kinks, other than those shown on the approved Shop Drawings shall be removed from the job site and replaced with a new expansion joint system at the expense of the Contractor. Expansion joint elastomeric seals not fully bonded to the steel shall be made fully bonded at the expense of the Contractor.

627.6.9.3-Acceptance:

- A. Each expansion joint system shall pass all three levels of inspection delineated in Section 627.6.9.2 of this Special Provision prior to acceptance. Any expansion joint system which fails any one of the three levels of inspection shall be replaced or repaired at no expense to the Department and to the satisfaction of the Engineer. Any proposed remedial procedures shall be submitted to the Engineer for approval before implementation.
- B. As stipulated in Section 627.4.3S of this Special Provision, fatigue resistance of all structural members, splices, connections, and components shall be established. For the specific expansion joint system to be installed, the Contractor shall be responsible for assuring that the fabricator has met the prequalification requirements of Section 627.2.1.1C of this Special Provision, and has performed any requisite fatigue testing in accordance with Sections 627.4.3.1 and 627.4.3.2 of this Special Provision.
- C. Once a fabricator's specific expansion joint system has been prequalified in accordance with Section 627.2.1.1C of this Special Provision, any revised

details or material substitutions shall be retested in accordance with Sections 627.4.3.1 and 627.4.3.2 of this Special Provision. All retesting shall have been completed by the contract award date in accordance with the prequalification requirements of Section 627.2.1.1C of this Special Provision. Any additional costs and/or time delays incurred as a result of failure to prequalify the details of the revised expansion joint system or delays associated with procuring an alternative expansion joint system fabricator shall be the Contractor's responsibility.

627.7-BLANK:

627.8-BASIS OF PAYMENT:

The contract unit price for Modular Expansion Joint System shall be full payment for all materials, including elastomeric concrete, labor, tools, equipment, design, testing, inspection, services, and incidentals necessary to furnish and install the expansion joint systems as specified.

The contract unit price includes the welded wire fabric and concrete placed in the blockouts.

627.9-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
627011-002	Remove and Replace Expansion Device, Modular Joint	Linear Foot
627020-001	Install Modular Expansion Joint System	Linear Foot
627020-002	Expansion Joint System Behind Approach Slab, Modular Joint	Linear Foot

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 601 STRUCTURAL CONCRETE

601.3-PROPORTIONING:

601.3.1-Mix Design Requirements:

ADD THE FOLLOWING SUBSECTION:

601.3.1.1-Mix Design Using Potentially Reactive Aggregate: Alkali-Silica Reaction (ASR) is a reaction between the alkali hydroxide in concrete pore solution and reactive forms of silica in the aggregate. The reaction forms a gel that swells when moisture is present and may cause deleterious expansion within the concrete.

The Division will sample aggregate according to MP 700.00.06 and test fine aggregate and coarse aggregate in accordance with AASHTO T 303 to determine the reactivity class of aggregate. The reactivity class for each aggregate source will be listed on the MCS&T web page under Division Approved Source/Product Listing (APL) for aggregate. If the reactivity class of an aggregate Source is not listed on the APL, the Division will test fine and coarse aggregate from the Source, in accordance with AASHTO T 303, to determine the reactivity class of the aggregate prior to its use on any WVDOH project. If one or both of the aggregates (coarse or fine) used in a concrete mix are reactive (R1, R2 or R3), preventive measures are required as specified in section 601.3.1.1.1.4. The Division will test Aggregate Sources on a 3-year cycle in accordance with AASHTO T 303.

Aggregate Suppliers may have their fine aggregate and coarse aggregate tested in accordance with ASTM C1293 at a Division approved lab (an AASHTO accredited Lab, accredited for ASTM C1293) at the Aggregate Supplier's expense. The sampling and shipping of all aggregate shall be witnessed by a representative of the Division. Aggregate Suppliers may also submit results of ASTM C1293 tests which were performed by another State DOT lab. The results of ASTM C1293 testing and the resulting determination of the reactivity class of aggregate shall supersede the reactivity class of aggregate, as determined by the Division, when tested in accordance with AASHTO T 303. ASTM C1293 test will be considered valid for 5 years from the date of testing.

This requirement applies to all permanent concrete structures on WVDOH projects.

601.3.1.1.1-Selecting Preventive Measures For ASR: The level of prevention shall be determined by considering the classes of concrete, precast concrete member, prestressed

concrete member, the degree of aggregate reactivity and the level of alkalis from the Portland cement. The different levels of prevention are shown in Table 601.3.1.1.1.3.

601.3.1.1.1.1-Aggregate Reactivity: The degree of ASR reactivity of an aggregate will be determined as outlined in 601.3.1.1. Aggregate-reactivity classes are given in Table 601.3.1.1.1.1. If the coarse and fine aggregates in a mix design are of different reactivity classes, the level of prevention shall be selected for the most reactive aggregate type in the mix.

TABLE 601.3.1.1.1.1
Classification of Aggregate Reactivity

Aggregate-Reactivity Class	Description of Aggregate Reactivity	14-Day Expansion when tested in accordance with AASHTO T 303, %	1-Year Expansion when tested in accordance with ASTM C1293
R0	Non-Reactive	≤ 0.10	≤ 0.04
R1	Moderately Reactive	>0.10 to ≤ 0.30	>0.04 to ≤ 0.12
R2	Highly Reactive	>0.30 to ≤ 0.45	>0.12 to ≤ 0.24
R3	Very Highly Reactive	>0.45	>0.24

601.3.1.1.1.2-Level of ASR Risk: Determine the level of ASR risk occurring in a structure by considering the aggregate reactivity class in Table 601.3.1.1.1.2.

TABLE 601.3.1.1.1.2

Aggregate-Reactivity Class	R0	R1	R2	R3
Level of ASR Risk	Risk Level 0	Risk Level 1	Risk Level 2	Risk Level 3

601.3.1.1.1.3-Level of Prevention: The level of prevention required is determined from Table 601.3.1.1.1.3 by considering the risk of ASR from Table 601.3.1.1.1.2 in different classes of concrete, precast concrete member and prestressed concrete member (Section 603).

TABLE 601.3.1.1.1.3
Determining the Level of Prevention

Level of ASR Risk	Classes of Concrete		Precast Concrete Member	Prestressed Concrete Member
	D	A, B, C, K, H, DC		
Risk Level 0	V	V		V
Risk Level 1	W	X		Y
Risk Level 2	X	Y		Z
Risk Level 3	Y	Z		See footnote**

** It is not permitted to construct prestressed concrete members (Section 603) with Aggregate Reactivity Class of R3. Measures must be taken to reduce the level of risk in these circumstances by selecting the aggregates only from the Reactivity Classes of R0, R1, or R2.

601.3.1.1.1.4-Requirements for Various Prevention Levels: These requirements shall apply to all classes of concrete except Class H. The prevention levels for Class H concrete is specified in section 601.3.1.1.1.5.

601.3.1.1.1.4.1-Prevention Level V: No special measures need to be taken for prevention level V.

601.3.1.1.1.4.2-Preventions Level W, X and Y: If it is determined that prevention level W, X, or Y is required, there are two options for prevention as follows:

Option 1: Limiting the Alkali Content of the Concrete: Table 601.3.1.1.1.4.2a prescribes maximum permissible concrete alkali contents in a concrete mix. The alkali content of concrete is calculated on the basis of the alkali contributed by the Portland cement alone.

TABLE 601.3.1.1.1.4.2a
Maximum Alkali Contents in Portland Cement Concrete
to Provide Various Levels of Prevention

Prevention Level	Maximum Alkali Content of Concrete (Na ₂ O _e)	
	kg/m ³	lb/yd ³
V	No limit	No limit
W	3.0	5.0
X	2.4	4.0
Y	1.8	3.0

Note: The alkali content of the concrete is calculated by multiplying the Portland cement content of the concrete by the alkali content of the Portland cement. The alkali content of all approved cement sources is listed on the WVDOH list of Certified Portland Cement Mills. For example, for concrete containing 550 lb/yd³ of Portland cement, which has an alkali content of 0.82 percent Na₂O_e, the alkali content of the concrete is $550 \times 0.82/100 = 4.51$ lb/yd³ Na₂O_e. SCMs also contain alkalis; however, the use of SCM usually increases the amount of alkalis bound by the hydrates and thus reduces the available alkali content in the concrete. Thus, the alkalis present in SCMs do not need to be considered when calculating the alkali content of the concrete. However, the alkali content of the SCM shall not exceed the limits given in Table 601.3.1.1.1.4.2b. The alkali content of all approved SCM source is listed on the WVDOH approved list of SCMs.

Option 2: Using Minimum Supplementary Cementitious Materials (SCM) based on Level of Prevention. Utilize a minimum mass replacement level from Table 601.3.1.1.1.4.2b below.

TABLE 601.3.1.1.1.4.2b

Minimum Replacement Level of SCM (percentage by mass of cementitious material)

Type of SCM	Alkali Content of SCM* (Na ₂ Oe)	Level W	Level X	Level Y
Fly ash** (Cao ≤18%)	≤3.0	15	20	25****
	>3.0, ≤4.5	20	25****	Not Allowed
Slag Cement	≤1.0	25	35	50
Silica Fume***	≤1.0	1.2 x LBA or 2.0 x KGA	1.5 x LBA or 2.5 x KGA	1.8 x LBA or 3.0 x KGA

* The alkali content of all approved SCM sources is listed on the WVDOH approved list of SCMs (APL). If the alkali content of an SCM source is not listed on the APL, the Division will test the SCM from the source to determine the alkali content prior to its use on any WVDOH project.

** The CaO content of approved fly ash sources is listed on the WVDOH approved list of fly ash (APL). If the CaO content of a fly ash source is not listed on the APL, the Division will test the fly ash from the source to determine the CaO content prior to its use on any WVDOH project.

*** The minimum level of silica fume (as a percentage by mass of cementitious material) is calculated on the basis of the alkali (Na₂Oe) content of the concrete contributed by the Portland cement and expressed in lb/yd³ (LBA in Table 601.3.1.1.1.4.2b). LBA is calculated by multiplying the cement content of the concrete in lb/yd³ by the alkali content of cement divided by 100. For example, for a concrete containing 500 lb/yd³ of cement with an equivalent alkali content of 0.81 percent of Na₂Oe, the value of LBA = 500 x 0.81/100 = 4.05 lb/yd³. For this concrete, the minimum replacement level of silica fume for Level Y is 1.8 x 4.05 = 7.3 percent. Regardless of the calculated value, the minimum level of silica fume shall not be less than 7 percent when it is only method of prevention. Mix design with silica fume > 8% shall be reviewed and approved by the Engineer.

**** Mix designs with minimum 25% of fly ash shall be reviewed and approved by the Engineer.

Note: The minimum replacement levels in Table 601.3.1.1.1.4.2b are appropriate for use with Portland cements of moderate to high alkali contents (0.71 to 1.00 percent Na₂Oe). Table 601.3.1.1.1.4.2c provides recommendations for adjusting the level of SCM when the equivalent alkali content of the Portland cement is above or below this range. The replacement levels should not be below those given in Table 601.3.1.1.1.4.2b for prevention level W, regardless of the equivalent alkali content of the Portland cement.

TABLE 601.3.1.1.1.4.2c

Adjusting the Minimum Level of SCM Based on the Alkali Content of the Portland Cement

Alkali Content (Na ₂ Oe)*	Level of SCM
≤0.70	Reduce the minimum amount of SCM required in Table 601.3.1.1.1.4.2b by one prevention level.*
>0.70, ≤1.00	Use the minimum levels of SCM required in Table 601.3.1.1.1.4.2b
>1.00, ≤1.25	Increase the minimum amount of SCM required in 601.3.1.1.1.4.2b by one prevention level.
>1.25	Not permitted to be used in PCC

* The alkali content of all approved cement sources is listed on the WVDOH list of Certified Portland Cement Mills (APL). If the alkali content of a cement source is not listed on the APL, the Division will test the cement from the source to evaluate alkali content prior to its use on any WVDOH project.

** The SCM replacement levels should not be below those required in Table 601.3.1.1.1.4.2b for prevention level W, regardless of the equivalent alkali content of the Portland cement.

601.3.1.1.1.4.3-Prevention Level Z: If it is determined that prevention level Z is required, limit the maximum alkali content of concrete to $\leq 3.0 \text{ lb/yd}^3$ (1.8 kg/m^3) plus use the minimum SCM replacement level shown for level Y in Table 601.3.1.1.1.4.2b.

The mix design for Prevention Level Z shall be reviewed and approved by the Engineer.

601.3.1.1.1.5-Requirements for Various Prevention Levels for Class H Concrete:

601.3.1.1.1.5.1-Prevention Level V: No special measures need to be taken for prevention level V.

601.3.1.1.1.5.2-Prevention Level X: The contractor may choose Option 1 or Option 2 from Table 601.3.1C. The alkali content of cement shall not exceed 1.25%. The alkali level of fly ash shall not exceed 4.5% in option 1. The CaO of the fly ash must be limited to a maximum of 18% in option 1. The alkali level of slag cement shall not exceed 1.00% in option 2. The alkali level of silica fume shall not exceed 1.00% in option 1 and option 2.

601.3.1.1.1.5.3-Prevention Level Y: The contractor may choose Option 1 or Option 2 from Table 601.3.1C if the alkali content of cement does not exceed 1.00%. The alkali level of fly ash shall not exceed 4.5% in option 1. The CaO of the fly ash must be limited to a maximum of 18% in option 1. The alkali level of slag cement shall not exceed 1.00% in option 2. The alkali level of silica fume shall not exceed 1.00% in option 1 and option 2.

601.3.1.1.1.5.4-Prevention Level Z: The contractor may choose Option 1 from Table 601.3.1C if the alkali content of cement does not exceed 1.00% and the alkali level of fly ash does not exceed 3.00%. The contractor may also choose Option 1 from Table 601.3.1C if the alkali content of cement does not exceed 0.85% and the alkali level of fly ash does not exceed 4.5%. The CaO of the fly ash must be limited to a maximum of 18%.

The contractor may choose Option 2 from Table 601.3.1C if the alkali content of cement does not exceed 0.85%. The alkali level of slag cement shall not exceed 1.00%. The alkali level of silica fume shall not exceed 1.00% in option 1 and option 2.

601.3.1.1.1.6- Evaluation of the effectiveness of SCM to prevent deleterious expansion: The contractor may evaluate the effectiveness of an SCM in the reduction of expansion in accordance with ASTM C1567*, when a reactive aggregate(s) is (are) used in a concrete mix, at a Division approved lab (an AASHTO accredited Lab, accredited for ASTM C1567) at the contractor's expense. The sampling and shipping of all aggregate shall be witnessed by a representative of the Division. ASTM C1567 test will be considered valid for 5 years from the date of testing.

If both of the aggregates (coarse and fine) used in a concrete mix are reactive (R1, R2 or R3), the contractor shall evaluate the effectiveness of SCM for both of the aggregates separately. When the same source material** is proposed for the use both as coarse and as fine aggregate, test only a selection of the reactive fine aggregate or reactive coarse aggregate, unless there is reason to expect that the coarse aggregate has a different composition than the fine aggregate or vice-versa. The combination of cement, SCM and

aggregate that expand less than 0.10% at 16 days after casting will be considered as meeting the “Requirements for Various Prevention Levels (Section 601.3.1.1.4)” except for Class H concrete. The evaluation with the higher percentage of SCM replacement shall be selected for the minimum replacement level of SCM for prevention level in a mix design using potentially reactive aggregate.

When more than one mix design, for the same Producer/Supplier, is submitted for evaluation, only one evaluation of the effectiveness of an SCM in the reduction of expansion in accordance with ASTM C1567 testing data, as outlined in paragraphs first through four of this sub-section, will be required for that entire group of mix designs (except Class H) if all of the mix design in that entire group of mix designs have the same combination of cement, SCM and aggregate sources.

The alkali level of fly ash shall not exceed 4.5%. ~~The CaO of the fly ash must be limited to a maximum of 18%.~~ The alkali level of slag cement shall not exceed 1.00%. The alkali level of silica fume shall not exceed 1.00%. Mix designs with minimum 25% of fly ash shall be reviewed and approved by the Engineer. Mix design with silica fume > 8% shall be reviewed and approved by the Engineer.

* Modify the w/c ratio of the mortar used in the ASTM C1567 test to 0.50.

** Same source material applies to same Limestone, Diabase, Quartzite and Basalt source.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 501

PORTLAND CEMENT CONCRETE PAVEMENT

501.3-PROPORTIONING:

ADD THE FOLLOWING PARAGRAPH AFTER PARAGRAPH ONE:

~~All~~ Any design mixes with an aggregate(s) that ~~have~~ has a reactivity classes R1, R2, ~~and~~ or R3, as shown as in Approved Aggregates Source List, shall be developed in accordance with subsection 601.3.1.1.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 603

PRESTRESSED CONCRETE MEMBERS

603.6-CONCRETE

603.6.2-Mix Design:

ADD THE FOLLOWING PARAGRAPH AFTER PARAGRAPH TWO:

~~All~~ Any design mixes with an aggregate(s) that ~~have~~ has a reactivity classes R1, R2, ~~and~~ or R3, as shown as in Approved Aggregates Source List, shall be developed in accordance with subsection 601.3.1.1. If an aggregate Source is not listed on the Approved Aggregates Source List, the Division will test the fine and coarse aggregate from the Source, in accordance with AASHTO T 303, to determine the reactivity class of the aggregate prior to its use on any WVDOH project. The Division will inform the Fabricator of the reactivity class of aggregates that they are proposing to use. If a cement Source and/or a SCM Source are not listed on the Approved Source List, the Division will test cement and/or SCM from that Source prior to its use on any WVDOH project.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 604 PIPE CULVERTS

604.12-INSPECTION AND ACCEPTANCE:

In addition to the inspection performed by the ~~Department~~Division during the initial installation of pipe culverts, a post installation inspection will be conducted before final acceptance. No sooner than 30 days following installation, the Engineer will visually inspect all culverts. Pipes larger than 42 inches² in diameter will be manually inspected by inspectors on the project for excessive deflection of flexible pipe, ~~and~~ excessive cracking in rigid pipe, and joint issues for all pipes. Inspectors will note and document any defects with locations in their daily work reports.

Any excessive cracks, differential movement, spalls, exposed reinforcement, delamination, slabbing, dents, buckling, holes, damaged coating, obstructions, improperly engaged joints, improper gasket placement, excessive joint gaps, misaligned joints, excessive deflection, or undue horizontal or vertical misalignment will be cause for repair or replacement at no cost to the Division. Efflorescence and rust stains should be evaluated to determine if detrimental or just a cosmetic defect.

604.12.1-Rigid Pipe Criteria: Concrete pipe cracks equal to or less than one hundredth of an inch (0.01) are considered hairline and minor. Cracks greater than one hundredth of an inch (0.01) but less than five hundredths of an inch (0.05), shall be sealed by the method proposed by the manufacturer and approved by the Engineer. Concrete pipe with cracks with width equal to or greater than five hundredths of an inch (0.05) and less than one tenth (0.1) shall be evaluated by the Engineer for repair or replacement. Concrete pipe with cracks one tenth (0.1) inch or greater in width shall be replaced by the Contractor to the satisfaction of the Engineer. Cracking, whether longitudinal or transverse, shall be evaluated as described above.

Spalling is defined as a localized pop-out of concrete along the wall of the pipe/culvert, or at the edges of longitudinal or circumferential cracks. If spall/chips are detected, there are 3 classifications:

- a. Spalled areas with no exposed reinforcement, are considered nonstructural and shall be patched with material from approved list and meeting Section 715.4 with R-3 requirements and approved by the Engineer.
- b. Spalled area with exposed reinforcement, with a single spall area less than or equal to 150 square inches, the Contractor shall submit repair plan for remediation to the Engineer.

- c. Spalled area with exposed reinforcement with a single spall area greater than 150 square inches, the Contractor shall submit a pipe analysis and remediation plan for repair or replacement.

Delamination and Slabbing appears as a separation of the concrete from the reinforcing steel and can be detected by a hollow sound when tapped with a device such as a hammer. If identified, the Contractor shall submit remediation methods for delamination/slabbing in accordance with recommendations of the pipe manufacturer, to the Engineer for approval before proceeding. Where delamination/slabbing is of such magnitude that, in the opinion of the Engineer, the integrity or service life of the pipe or culvert is severely compromised, the section(s) of pipe shall be replaced at the Contractor's expense to the satisfaction of the Engineer.

Maximum allowable joint gaps are dependent on each pipe manufacturer's joint design and equipment. Pipe manufacturers will provide maximum joint gaps based on minimum gasket compression required.

If any soil infiltration is identified at a pipe joint during inspection, a pipe analysis and a remediation plan for repair or replacement shall be submitted to the Engineer for approval.

604.12.2-Flexible Pipe Criteria: Flexible pipe deflection equal to or less than 5 percent of the original diameter will not require remediation. Deflections of 5 percent up to 7.4 percent of the original diameter will be evaluated by the Engineer for repair or replacement; if repaired the final pipe deflection must be equal to or less than 5 percent of the original diameter for acceptance. If flexible pipe is deflected 7.5 percent ~~of or more than~~ the original diameter, the pipe shall be replaced by the Contractor to the satisfaction of the Engineer.

~~Plastic pipe with cracks exceeding 1/8-inch width by 6 inches long shall be evaluated by the Engineer for structural and hydraulic integrity. Flexible pipe with any crack (interior, exterior, or both) shall be replaced to the satisfaction of the Engineer.~~

Pipes showing evidence of crushing at the joints will need a repair plan submitted to the Engineer for approval. Replacement at no cost to the Division as an option if necessary. If any soil infiltration is identified at the pipe joint during inspection, a pipe analysis and a remediation plan for repair or replacement shall be submitted to the Engineer for approval.

604.12.3-Testing of Pipe: A post installation camera/video inspection of pipe culverts and laser/mandrel deflection inspection of flexible pipe shall be conducted by the Contractor on all pipe culverts that meet the following requirements:

1. Cumulative total of ~~250-200~~ linear feet (~~75-70~~ m) or more of pipe culverts on project
2. Project located on NHS routes

The Contractor may visually inspect, in the presence of the Engineer, in lieu of camera/video inspection where pipe culverts size, orientation, and location allow for easy visual examination.

When camera/video inspection is required, it shall be conducted by the Contractor in the presence of the Engineer. The Contractor will note and document any defects or flaws with locations in their reports. Equipment used in these inspections must have the following features:

Camera/Video inspection equipment shall be:

1. Configured properly in the pipe both vertically and horizontally, and having the ability to pan and tilt to a 90 degree angle with the axis of the pipe and rotate 360 degrees.
2. Low barrel distortion camera capable to measure cracks as small as 0.01”.
3. Color image with a minimum standard resolution of 720x480 pixels.
4. Equipped with sufficient lighting to provide a clear image of the full circumference of the pipe.
5. Capable of recording the station, milepost, distance along the invert of the pipe, or other indicators of location superimposed on the video.
6. Capable of moving through the entire length of the pipe.
7. Software capable of generating a report that shows each fault along with its location from the inspection entrance and a still frame image of the fault.

Laser deflection measure device on flexible pipe up to 48 inches in diameter shall be capable of measuring deflection to an accuracy of 0.5% or better with a repeatability of 0.12% or better.

Mandrel device must have an odd number of legs (9 minimum) having a length not less than the outside diameter of the mandrel. The mandrel shall be pulled by hand with no mechanical assistance. The diameter of the mandrel, whether it is fixed or variable size, must be verified with a proving ring or other method as per the manufacturer’s guidelines. The minimum diameter of the installed pipe at any point shall not be less than the diameter, as calculated per equation below:

Minimum Diameter of Installed Pipe = (Actual Pipe Diameter) x (Deflection Percentage)

Where:

Actual Pipe Diameter = Inside pipe diameter of pipe being installed prior to installation

Deflection Percentage = 0.95 for 5% deflection and 0.925 for 7.5% deflection

The Contractor shall provide a digital copy of the camera/video inspection and issue a report in digital format, detailing all issues or deficiencies noted during the inspection, including a remediation plan for each deficiency, no later than 7 calendar days after completion of the inspection.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING:

SECTION 613

SPRAY APPLIED AND SPIN-CAST PIPE LINING

613.1-DESCRIPTION:

This work shall consist repairing and rehabilitating culverts and storm drain pipes by filling voids and lining the entire interior surface of the pipe with factory blended cementitious or geopolymer material. Material may be spray applied, centrifugally spin-cast or applied with hand tools. Application methods may vary based on the size and shape of the culvert. The term “host pipe” refers to the existing pipe being rehabilitated. This is applicable for pipes ranging in size from 30” to 120”.

The plans should include the following site information to facilitate design:

<u>Factor</u>	<u>Description / Units</u>
<u>Extent of Deterioration</u>	<u>Fully, Partial, or Condition of the Pipe Being Rehabilitated</u>
<u>Size & Material</u>	<u>Length of the Pipe, Diameter, and Pipe Material (Corrugated Metal Pipe, Reinforced Concrete Pipe, etc.)</u>
<u>Ovality</u>	<u>What % is the Pipe’s Deformity</u>
<u>Cover Depth (from crown)</u>	<u>How many Vertical Feet of Fill is Above the Crown of the Pipe</u>
<u>Soil Type</u> <u>(Density/Modulus)</u>	<u>Soil density (lb/ft³)</u> <u>E’ in (psi)</u>
<u>Water Table (from invert)</u>	<u>Where is the water table in relation to the invert (ft)</u>
<u>Loading</u>	<u>Up to a HS-25 Truck load according to AASHTO the Pipe is required to take</u>
<u>Factor of Safety</u>	<u>2.0</u>

613.2-MATERIALS:

Furnish materials for patching and filling voids conforming to the following.

Cementitious Materials

ASTM C1157

Geopolymer Materials

ASTM C1157, C989, C618

Furnished cementitious liner material that meets the following minimum property requirements:

Test Method	Test Property	Duration	Requirement	
AASHTO T 358	Surface Resistivity	28 Days	Minimum	14.3 kΩ-cm
ASTM C 109	Compressive Strength	1 day	Minimum	2500 psi
		28 Days	Minimum	8000 psi
ASTM C 1609	Flexural Strength	7 Days	Minimum	685 psi
		28 Days	Minimum	990 psi
ASTM C 418	Abrasion Resistance	28 Days	Maximum	0.085 cm ³ / cm ²
ASTM C 469	Modulus of Elasticity	28 Days	Minimum	3,360,000 psi
ASTM C 496	Tensile Strength	7 Days	Minimum	470 psi
		28 Days	Minimum	670 psi
ASTM C 1090	Height Change	28 Days	Maximum	-0.08%
ASTM C 1583	Bond Strength	28 Days	Minimum	615 psi
ASTM C 403	Set Time	Initial Set	Maximum	170 minutes
		Final Set	Maximum	300 minutes
ASTM C 666	Freeze Thaw	300 Cycles	40-0 °F and 0-40 °F in not less than 2 nor more than 5 hrs	
ASTM C 1202	Chloride Permeability	28 Days	Maximum	< 550 Coulombs

Furnished geopolymer liner material that meets the following minimum property requirements:

Test Method	Test Property	Duration	Requirement	
<u>ASTM C109</u>	<u>Compressive Strength</u>	<u>28 days</u>	<u>Minimum</u>	<u>8000 psi</u>
<u>ASTM C78</u>	<u>Flexural Strength</u>	<u>28 days</u>	<u>Minimum</u>	<u>800 psi</u>
<u>ASTM C88</u>	<u>Bond Strength</u>	<u>28 days</u>	<u>Minimum</u>	<u>3000 psi</u>
<u>ASTM C469</u>	<u>Modulus of Elasticity</u>	<u>28 days</u>	<u>Minimum</u>	<u>5 x 10⁶ psi</u>
<u>ASTM C1202</u>	<u>Chloride Ion Penetration Resistance</u>	<u>28 days</u>	<u>Maximum</u>	<u>250 Coulombs</u>
<u>ASTM C496</u>	<u>Split Tensile Strength</u>	<u>28 days</u>	<u>Minimum</u>	<u>900 psi</u>
<u>ASTM C1090</u>	<u>Shrinkage</u>	<u>28 days</u>	<u>Maximum</u>	<u>0.02%</u>
<u>ASTM C666</u>	<u>Freeze Thaw</u>	<u>300 Cycles</u>	<u>40-0 °F and 0-40 °F in not less than 2 nor more than 5 hrs</u>	
<u>ASTM C1138</u>	<u>Abrasion Resistance</u>	<u>6 cycles at 28 days</u>	<u>Maximum</u>	<u>loss < 1.0%</u>

613.3-SHIPMENT AND STORAGE:

Materials supplier and Contractor shall follow the manufacturer's recommendations for shipment and storage for all products, and ensure that the material safety data sheet accompanies the material.

The Contractor shall not use material from defective, punctured, or damaged containers and ensure that each container is labeled with a batch or lot number and an expiration or use by date. Contractor shall not use material that exceeds the use by date or useful life.

613.4-INSTALLATION PLAN:

The Contractor shall submit a written installation plan for the pipe renewal to the Engineer for acceptance at least ten calendar days before beginning work. The submission shall include the following information:

1. All calculations shall be performed and signed and sealed by a registered Professional Engineer in the state of West Virginia. The design of the rehabilitation system will be required to support the dead load and live load, address the spray liner physical properties, and the provide minimum lining thicknesses. The minimum allowable thickness is 0.5 inch; where bolts are present, a minimum 0.5 inch thickness over the bolt is required. The calculated minimum finished thickness of the liner shall be based on a maximum possible crack width of 0.01 inch with a factor of safety of 2.0. Liner thicknesses do not have to be uniform.
2. Required minimum lining thickness, invert lining thickness, and proposed manufacturer's material.
3. Method of cleaning the host pipe.
4. Plan to bypass flow around the host pipe.
5. Method to verify applied thickness during installation.
6. Video survey of the host pipe before installation.
7. Site specific health and safety plan.
8. A certification letter from the manufacturer stating that the contractor is an approved installer of the material.

The Contractor cannot make any changes or deviations from the accepted submittals without resubmitting and approval by the Engineer. The Engineer will not grant an extension of time because of incomplete or subsequent submittals.

During construction, the contractor shall submit the following information to the Engineer:

1. Test results that demonstrate the liner material meets the material requirements.
2. Daily thickness measurements of the spray material.
3. Temperature and humidity readings in the host pipe.

613.5-CONSTRUCTION:

- A. **Preparation.** Remove all debris and obstructions from the host pipe. Clean and prepare the surface of the host pipe according to the manufacturer's recommendations.
- B. **Flow Bypass.** Prevent the accumulation and flow of water through the host pipe and liner until after the work is complete. When required, bypass flows around the host pipe in

accordance with the requirements of the contract documents. After the lining process begins, maintain the bypass flow until the lining process, including curing, is complete. All immediately connected manholes and inlets should be plugged to prevent water from coming through the host pipe. Comply with USACE 404 and NPDES permits if applicable.

- C. **Preinstallation inspection.** After cleaning and before beginning the lining process, inspect the host pipe to ensure there are no obstructions that would hinder the lining process. Perform a pre-installation video survey of the host pipe and provide a copy of the video to the Engineer.
- D. **Installation.** Measure and record the temperature and humidity. The upper limit ambient and surface temperature is 100 Degrees Fahrenheit. The lower limit is 45 Degrees Fahrenheit when ambient temperatures are expected to fall below within 72 hours of placement. Suspend work if conditions are expected to be outside the acceptable range.

Patch corrugations, holes, and gaps in the host pipe with an approved hydraulic cement or the same cementitious or geopolymer based material to be used for the liner to provide a solid continuous surface on which to spray. Completely stop water infiltration into the host pipe.

Protect walls, surfaces, streambed and plants at the entrance and exit of the host pipe from overspray. Apply the material to the prepared surface using methods that provide a uniform surface. Use only equipment recommended by the manufacturer to perform the spray lining. Minimize hand troweling to the extents practicable.

Record the batch or lot number from the containers and weight of material used each day.

For cementitious or geopolymer material, prepare 3 specimens for the 1 day and 3 specimens for the 7 day and 3 specimens for the 28-day test as required per ASTM C109. Prepare an additional 3 specimens for reserve for a total of 12 test specimens. Utilize an ACI Certified level one sample technician or WVDOT equivalent to properly obtain and transport the test specimens to the District's Materials Lab. Conduct air testing daily to ensure cementitious or geopolymer material is within manufacturers specifications.

Ensure the liner is continuous over the entire length of the host pipe and free from defects such as foreign inclusions, holes, and cracks larger than 0.01 inches wide. Ensure the renewed pipe is impervious to infiltration and exfiltration.

613.6-AFTER INSTALLATION:

The Contractor shall repair all defects in the liner as directed by the Engineer. All repairs shall be at no additional expense to the Division.

Perform non-destructive testing to verify liner thickness at the crown, invert, and spring lines at an interval of 20 ft for the entire length of the liner. Ensure the accuracy of the pachometer by physically measuring the liner thickness at the ends of the pipe or by other methods accepted by Engineer. Other non-destructive testing methods may be used if accepted by the Engineer. Furnish all the measurements to the Engineer.

613.7-WARRANTY:

For project located on NHS Routes, the Contractor shall provide a one-year written Manufacturer Material warranty which shall warrant all work against defects in materials and workmanship. The Manufacturer shall replace or repair any lining system components

demonstrating unsatisfactory performance or durability within the one-year period commencing from the date of completion of the contract. All material, labor costs, and all other items need to install (including traffic control and incidentals) shall be paid by the Manufacturer.

613.8-METHOD OF MEASUREMENT:

If required, invert and void repair will be incidental to the pipe lining work. "Spray Applied or Spin Cast Pipe Lining" will be paid measured by the linear foot of accepted pipe covered by required minimum thickness.

613.9-BASIS OF PAYMENT:

Payment for "Spray Applied or Spin Cast Pipe Lining" includes submittals, excavation, backfill, encasement, preparation, flow bypass, inspections, and all other work and incidentals required to complete the specified items.

613.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
613002-*	"size" Spray Applied or Spin Cast Pipe Lining	Linear Feet

* Sequence Number

"size" Nominal diameter of host pipe being lined

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 720 SMOOTHNESS TESTING

720.4-RIDE QUALITY ANALYSIS:

720.4.4-Rounding:

DELETE THE ENTIRE SUBSECTION 720.4.4.

720.5-NATIONAL HIGHWAY SYSTEM (NHS) PAVEMENT PROJECT:

720.5.4-Schedule 3 NHS Pavement Projects:

DELETE THE CONTENTS OF THE 720.5.4 AND REPLACE WITH THE FOLLOWING:

NHS pavement projects with a pavement thickness less than three (3) inches and more than one (1) inch shall be classified as Schedule 3 NHS Pavement Projects. The final price adjustments for Schedule 3 NHS Pavement Projects shall be determined using the calculations shown in Table 720.5.3. Payment for any bonus on a project shall require the average IRI for the entire project to be 67 in/mi or less.

TABLE 720.5.4
Schedule 3 NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	Price Adjustment (\$)
46.0 or Less	+300
46.1 to 76.0	-10 (IRI) + 760
76.1 to 80.0 or Greater	0
<u>80.1 to 120.0</u>	<u>1,200 – 15 (IRI)</u>
<u>120.1 or Greater</u>	<u>-600</u>

720.6-NON-NATIONAL HIGHWAY SYSTEM PAVEMENT PROJECTS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING

Pavement projects located on any Non-NHS routes shall be tested with equipment outlined in 720.2.1, 720.2.2 and 720.3 if the project meets all four of the following requirements:

1. Resurfacing is the primary project type
2. Greater than ~~0.2 miles~~ 1 mile of continuous pavement,
3. Edge lines and center line on the new pavement in accordance with Section 663.
4. Thickness of one inch (1) or more of new pavement (including scratch if used)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 412

WINTER GRADE ASPHALT PATCHING MIXTURE

DELETE THE ENTIRE SECTION.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING SECTION:

SECTION 412 WINTER GRADE ASPHALT PATCHING MIXTURE

412.1-DESCRIPTION:

This work shall consist of preparing a mixture of aggregate and bituminous material suitable for stockpiling and remaining workable for a period of six months.

412.2-MATERIALS:

412.2.1-~~Bituminous~~-Asphalt Material: The material shall conform to the requirements of 705.1, Winter Grade Cut-Back Asphalt.

412.2.2-Aggregate: The aggregate shall consist of crushed stone, crushed gravel, or slag, meeting the requirements of 703.1, 703.2 and 703.3 respectively, and sand meeting the requirements of 702.3. The gradation of the final mixture shall be as follows:

<u>Sieve Sizes</u>	<u>Percent Passing</u>
1/2 in.(12.5 mm)	100
3/8 inch(9.5 mm)	85-100
# 4 (4.75 mm)	25-65
# 8 (2.36 mm)	10-20
# 100 (150 μ m)	0-5

CONSTRUCTION METHODS

412.3-MIXING PROPORTIONS:

Samples of ~~bituminous~~-asphalt materials and aggregates intended to be used shall be furnished the Division who will advise the mixture proportions to be used.

412.4-PREPARATION OF MIX:

The asphaltic binder shall be heated to 150° to 175° F (66 to 79° C), care being taken to prevent local overheating. The aggregate and ~~bituminous-asphalt~~ material shall be measured separately and accurately to the proportions in which they are to be mixed. After the aggregate and binder have been combined, they shall be thoroughly mixed until all particles of the aggregate are coated. At no time shall the finished mixture be at a temperature greater than 150° F (66° C).

The constituents shall be combined in such proportions as to produce a mixture conforming to the following composition by weight:

	<u>Limestone or Gravel Percent</u>	<u>Slag Percent</u>
Total Mineral Aggregate	94.0-95.0	92.5-94.0
Winter Grade Cut Back Asphalt	5.0-6.0	6.0-7.5

When the correct percentage of ~~bituminous-asphalt~~ material is established for a given aggregate, this quantity shall not vary more than minus 0.1 percent or plus 0.3 percent.

412.5-METHOD OF MEASUREMENT:

The quantities of work done will be measured in tons (megagrams) of "Winter Grade ~~Bituminous-Asphalt~~ Patching Mixture", F.O.B. vendor's plant or stockpile, or the Division's stockpile as designated.

The number of tons (megagrams) of "Winter Grade ~~Bituminous-Asphalt~~ Patching Mixture" shall be determined by the total of the weights shown on receipted railroad freight bills when materials are shipped by rail; by actual measured displacement of barges certified by the producer when water shipments are made, providing materials delivered by the methods are not stockpiled or stored; or determined by the Contractor from the total of weigh slips for each vehicle load weighed on an approved standard scale or from digital printout slips from an automatic batching plant, and certified by the Contractor to be correct.

Truck scales shall be provided by the producer or Contractor, except that truck scales are not required where the material is weighed at properly calibrated automatic batching plant facilities which are equipped with digital print-out equipment. The scales shall be of sufficient size and capacity to weigh the heaviest loaded trucks that are used for delivery of the material.

All truck scales shall be mounted on solid foundations which will insure their remaining plumb and level. All truck scales shall be inspected and sealed by the West Virginia Division of Labor, Bureau of Weights and Measures, or other appropriate agencies of the State or its political subdivisions. The Division may, at its option, accept inspection and sealing by out of state agencies when the material is weighed outside West Virginia.

A weigh person shall be provided by the producer. The weigh person shall certify that the weight of the material, as determined either by the truck scales or from the digital printout of the weights, is correct.

Each truck shall be weighed empty prior to each load, except at automatic batch plants approved to operate without truck scales. A digital recorder shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare and net weights, and the time, date, truck identification and project number. Provision shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked so as to allow printing only when the scale has come to rest. In case of a breakdown of the automatic equipment, the

Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

412.6-BASIS OF PAYMENT:

The quantity, determined as provided above, will be paid for at the contract unit price bid for the item listed below, which price and payment shall be full compensation for furnishing and handling all the materials incorporated in the mixture.

412.7-PAY ITEM:

ITEM	DESCRIPTION	UNIT
412001-*	Winter Grade Bituminous -Asphalt Patching Mixture, **	Ton (Megagram)

* Sequence number

** Type of Aggregate

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 601
STRUCTURAL CONCRETE**

601.1–DESCRIPTION:

ADD THE FOLLOWING PARAGRAPH AFTER CLASS DC CONCRETE:

Class H Lightweight concrete shall be used for bridge decks and other bridge elements when designated in the Plans.

601.3–PROPORTIONING:

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

Class H Lightweight Concrete shall have an oven-dry density of $115 \pm 5 \text{ lb/ft}^3$ when tested in accordance with ASTM C567. The average result of the rapid chloride permeability tests performed on both batches in the mix design shall not exceed 1750 coulombs.

601.3.1–Mix Design Requirements:

ADD THE FOLLOWING AFTER THE FIRST PARAGRAPH IN THE SUBSECTION:

Oven-dry density testing, in accordance with ASTM C567, shall be performed on each batch of Class H Lightweight Concrete during the mix design development process. The average oven-dry density of the two mix design batches shall be $115 \pm 5 \text{ lb/ft}^3$ and shall be noted as $DENS_{OD}$. The average unit weight of the plastic concrete, determined in accordance with AASHTO T121, of both batches of Class H Lightweight Concrete, determined during the mix design development process, shall also be recorded and noted as UW_{Design} .

The following formula shall be used to determine the maximum allowable unit weight of fresh concrete when tested in the field:

$$UW_{Max} = 120 \times (UW_{Design} \div DENS_{OD})$$

Where:

UW_{Max} = Maximum allowable unit weight of fresh concrete when tested in the field (lb/ft³)

UW_{Design} = Average unit weight of fresh concrete from both mix design batches (lb/ft³)

$DENS_{OD}$ = Average oven dry density from both mix design batches (lb/ft³)

601.3.2-Field Tolerances and Adjustments:

601.3.2.4–Total Solids \bar{A} :

ADD THE FOLLOWING PARAGRAPH AFTER THE TABLE:

The Design Mix \bar{A} Tolerance for Class H Lightweight concrete shall be based on the nominal maximum size (NMS) of the lightweight coarse aggregate in the mix. The tolerance used in Table 601.3.2.4 for the standard AASHTO Size Number Aggregate with the same NMS as the NMS of the lightweight coarse aggregate in the mix shall apply.

601.4–TESTING:

601.4.1–Sampling and Testing Methods:

ADD THE FOLLOWING TO THE TABLE:

Standard Test Method for Determining Density of Structural Lightweight Concrete	ASTM C567
---	-----------

ADD THE FOLLOWING AT THE END OF THE SUBSECTION:

Air content testing of Class H Lightweight Concrete shall be performed in accordance with AASHTO T196 (Air Content of Freshly Mixed Concrete by the Volumetric Method).

ADD THE FOLLOWING SUBSECTION:

601.4.6–Additional Field Tests for Class H Lightweight Concrete: A unit weight test, in accordance with AASHTO T121, shall be conducted in the field on the first three batches of Class H Lightweight concrete produced on a project and then at least once per half-day of operation after that. If the result of any of these field unit weight tests exceeds the average unit weight of the plastic concrete established in the approved mix design (UW_{Design}) by more than 2%, the Contractor shall take immediate corrective action to lower the unit weight of the concrete (adjustment to the lightweight coarse aggregate proportion in the mix shall be permitted), and additional unit weight tests shall be performed on subsequent batches of concrete until the unit weight of the concrete is not more than 2% greater than UW_{Design} . If the result of any unit weight test conducted in the

field exceeds UW_{Max} (as defined in Section 601.3.1), the concrete shall be rejected, and a unit weight test shall be performed on the following batch of concrete.

Each time that a set of cylinders is fabricated in the field for compressive strength testing, the Contractor shall fabricate an additional set of cylinders for oven-dry density in accordance with ASTM C567. The Contractor shall have these specimens tested by a Laboratory which is accredited by AASHTO re:source for ASTM C567. The average oven-dry density of that set of cylinders shall be considered the density of the same quantity of concrete which is represented by the compressive strength cylinders. Any quantity of concrete with an oven-dry density of more than 120 lb/ft³ shall be considered as not meeting specification requirements. The Engineer shall evaluate the concrete with this oven-dry density and decide whether to allow it to remain in place.

601.15-BASIS OF PAYMENT:

601.15.2–Price Adjustments:

ADD THE FOLLOWING PARAGRAPH AT THE END OF THE SUB-SECTION:

If the Engineer allows Class H Lightweight Concrete with an oven-dry density exceeding 120 lb/ft³, as determined by oven-dry density tests conducted on samples fabricated in the field as outlined in Section 601.4.6, to remain in place, a price adjustment of 2.0% of the unit bid price of Class H Lightweight Concrete shall be assessed to the quantity of concrete in question for every 1 lb/ft³ by which it exceeds 120 lb/ft³.

601.16-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
601009-015	Class H Lightweight Concrete	Cubic Yard (Meter)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**DIVISION OF HIGHWAYS****SUPPLEMENTAL SPECIFICATION****FOR****SECTION 604
PIPE CULVERTS****604.2-MATERIALS:**

ADD THE FOLLOWING ITEM TO THE TABLE:

MATERIAL	SUBSECTION
<u>Random Material</u>	<u>716.1.1</u>

604.4-TRENCH EXCAVATION:**604.4.1-Pipe Culverts 18 Inches (450mm) Trough 96 Inches (2400mm):****604.4.1.1-Pipe Culverts Installed Using Controlled Low Strength Material (Type F Trench):**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

When using a controlled low strength material (CLSM) the width of the trench shall not be less than the values in the table in Standard Detail DR-10; and for trenches in rock , a minimum trench width of Outside Diameter plus 6 inches on each side of the pipe.

604.8-BACKFILLING:**604.8.2-Final Backfill Zone:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Unless otherwise noted in the plans, the area above initial backfill zone shall be one of the following:

1. suitable random material ~~free from particles larger than 1 inch (25mm)~~ with material sized up to 3" (75mm) with no more than 20% retained on the 1-1/2 sieve (40mm).
2. crushed aggregate, or
3. controlled low strength material.

_____ This method of backfilling and compacting shall be followed until the top of the trench is reached.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 636 MAINTAINING TRAFFIC

636.3-CONTROL OF TRAFFIC THROUGH WORK AREAS:

DELETE THE ELEVENTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Positive barriers shall be either Temporary ~~concrete~~ Barrier, or Temporary Guardrail Barrier, as specified in the Plans. Temporary Guardrail Barrier shall be installed with 6 feet 3 inches (1.905 meter) post spacing with block outs, unless otherwise specified. The end treatment for Temporary Guardrail Barrier shall be FET, or TET, or STET as specified on the Standard Details. Payment for the end treatment shall be made under the regular pay item. The ends of the Temporary ~~concrete~~ Barrier shall be either flared or protected, as indicated-shown on the Plans. Where Temporary Guardrail Barrier is used, a minimum clearance behind the barrier-guardrail of 4 feet (1.2 m) from the face-back of the guardrail post shall be provided.

For Temporary Barriers, the required Test Level and Deflection requirements shall be supported from accredited crash test facilities with complete modeling, simulations and crash testing at said test levels. Temporary Barriers that control impacting vehicles by gating, capturing, or allowing the vehicle to penetrate the barrier shall not be acceptable.

636.25-PAY ITEMS:

DELETE THE FIVE PAY ITEMS FOR ITEM 636017 AND REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
636017 *	Temporary Barrier, TL-1, **	Linear Foot (Meter)
636017-*	Temporary Barrier, TL-2, **	Linear Foot (Meter)
636017-*	Temporary Barrier, TL-3, **	Linear Foot (Meter)
636017 *	Temporary Barrier, TL-4, **	Linear Foot (Meter)
636017 *	Temporary Barrier, TL-5, **	Linear Foot (Meter)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

**FOR
HIGH TENSION CABLE BARRIER SYSTEM**

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 607
GUARDRAIL**

DELETE THE HEADING AND CHANGE TO THE FOLLOWING:

**SECTION 607
GUARDRAIL AND HIGH TENSION CABLE BARRIER SYSTEM**

607.1-DESCRIPTION:

ADD THE FOLLOWING TO THE SUBSECTION:

The work includes furnishing and erecting a 4 wire rope High Tension Cable Barrier (HTCB) system meeting the requirements of ~~National Cooperative Highway Research Program (NCHRP) 350 or the~~ Manual for Assessing Safety Hardware (MASH) 2016 for the cable barrier system, terminals and all appurtenances. The furnished HTCB system shall have a letters of eligibility from FHWA or letters of certification from a FHWA accredited test facility for a MASH tested 4 cable system including terminals meeting Test Level (TL-3 or TL-4) ~~tested on a slope of 6:1 or steeper.~~ The HTCB system shall be selected from the Division's Approved Product List.

The work shall conform to the lines, grades, and locations shown on the Plans or as directed by the Engineer. The cable barrier shall be placed in accordance with the cable system manufacturer's instructions and in accordance with the Division approved shop drawings and submittals prepared by the manufacturer of the cable barrier system.

Unless provided for on the plans, the work covered by this special provision includes only work necessary to install the cable barrier system and appurtenances. It includes the following:

1. Furnishing and placement of concrete foundations for the anchors, line posts and the end terminals.
2. Providing and installing the cable system and all hardware and appurtenances for a complete and functional cable barrier system by one manufacture. All components are

- to be of the same type.
3. Conducting installation training prior to the installation of the barrier system and maintenance training after installation of the system.

607.2- MATERIALS:

ADD THE FOLLOWING TO THE SUBSECTION:

607.2.1-HTCB Materials: The wire rope shall be galvanized, 3/4”-3x7 meeting requirements of AASHTO M30-92 Type I, Class A coating with minimum breaking strength of 39,000 pounds. Wire rope shall be ~~pre-tensioned~~ pre-stretched during manufacturing to exhibit a minimum modulus of elasticity of 11,805,090 pounds per square inch (8,300 kg/square mm). Provide a Certificate of Quality from the wire rope manufacturer with each cable spool specifying breaking strength, modulus of elasticity and the amount of force used to elongate the wire rope.

Provide factory swaged threaded terminals, the same as those crash tested in the manufacturers approved MASH tested system, for connecting the wire ropes at the turnbuckles. A maximum of two wedge-type connections that secure the wire rope by compression may be used per wire rope per segment.

Threaded terminals, turnbuckles and fittings shall be galvanized after threading and meet the requirements of ASTM A-153. The fittings shall be designed for the cable arrangement used and fully fitted connections shall have minimum breaking strength of 36,800 pounds, certified by test reports that shall be submitted to the Engineer. Turnbuckles shall be of the solid or closed body type with two holes to determine cable stud thread penetration. Turnbuckles shall be installed at a maximum spacing of 1000 Feet intervals.

The line posts shall meet the manufacturer’s specifications and be consistent with the post size tested to the MASH 2016 criteria. ~~specified in the FHWA NCHRP 350 or MASH acceptance letter.~~ Furnish steel posts meeting the requirements of ASTM A-36 galvanized to ASTM A-123 requirements following fabrication. The posts shall be designed to hold the wire at the design height. The posts shall be inserted in plastic or galvanized metal sockets or sleeves conforming to the manufacturer’s design. Provide a low-density polyethylene (or similar type material) excluder profiled to fit tightly around the post to prevent debris from entering the sockets.

The line post ~~shall~~ foundation shall be compatible with the concrete mow strip as shown in the plans.

The line post shall have retroreflective sheeting on every fourth post or 50 feet, whichever is less. The sheeting shall be Type XI, Fluorescent-yellow meeting the requirements of Section 715.9.2.4 with a minimum surface area of 9 square inches. ~~Place~~ Fluorescent-yellow sheeting shall be applied directly on both sides of the post using a. ~~A post cap method of sheeting attachment, that may detach upon impact to the line post, shall not be permitted.~~ The retroreflective sheeting shall be placed as high as possible on the line post.

~~All materials including wire rope, fittings, posts, reflectorized spacers or post caps, and terminals shall meet the approved manufacturer’s specifications and details and shall be approved by the Engineer prior to installation.~~

“Open wedge” connections as allowed on low tension cable systems shall not be used. Swaged fittings shall be required. Connections at anchorages needed to field adjust the cables may be “closed wedge” compression type fittings.

Any damage (break in the coating) to exposed steel or metal that is required to be galvanized shall be repaired or retouched to the satisfaction of the Engineer or shall be replaced with fittings or materials with the factory coating intact.

The End Terminals shall have a minimum of 120 square inches of Type XI retroreflective sheeting meeting the requirements of Section 715.9.2.4 affixed to each of the terminal posts.

All materials including wire rope, fittings, posts, reflectorized spacers or post caps, and terminals shall meet the approved manufacturer’s specifications and details and shall be approved by the Engineer prior to installation.

607.2.1.1-HTCB Repair Materials: Quantities of repair materials for use by the Division shall be provided by the contractor after the project is substantially complete and prior to Final Acceptance of the project. The materials shall be delivered at the site(s) identified in the proposal. All materials below shall meet the requirements as defined by 607.2.1.

1. Line Post with Hardware-Materials Only: The proprietary line post with all hardware including retroreflective sheeting and appurtenances identical to the system tested and installed by the contractor shall be provided. The required hardware and appurtenances for each line post shall be shrink wrapped around the line post individually and delivered. The quantity of retroreflective sheeting shall be sufficient to be applied to one-fourth of the Line Posts delivered.
2. Cable End Terminal-Materials Only: The proprietary Cable End Terminals and all required hardware shall be provided as a complete system wrapped individually and labeled.
3. Cable Splice-Materials Only: Cable Splices and all required hardware shall be provided as a complete system wrapped individually and labeled.
4. The Tension Meter required shall be new and meet the requirements to test the furnished HTCB System to the limits as MASH 2016 tested. The Tension Meter shall have documentation of calibration by the manufacturer within one (1) year of delivery.

607.2.2-Geotechnical Data: The known soil data to the Division is made part of the Contract documents. Any additional soil data required, shall be the responsibility of the Contractor and all costs shall be included in Pay Item, “Cable End Terminal Foundation”.

It is the Contractor’s responsibility to supply the cable barrier manufacturer with any soil information needed to design the End Terminal Foundations.

All soil information gathering shall be considered incidental to construction of the cable system at no additional cost to the ~~contract~~ Division.

The existing median shall be graded to a proposed 6.0:1 or flatter side slope where shown in the plans. The proposed grading and drainage work required shall not be part of this provision and shall be paid for separately per the appropriate items in this contract.

The cable barrier system described below requires side slopes of 6.0:1 or flatter.

607.2.3-Submittals: Submittals listed below shall be provided at least 30 days prior to initiating work and submitted electronically.

- ~~1. Provide an FHWA Eligibility Letter for National Cooperative Highway Research Program (NCHRP) 350 or Manual for Assessing Safety Hardware (MASH) FHWA Eligibility Letter for the cable barrier system. The HTCB system shall have a letter of eligibility from FHWA for a tested 4 cable system meeting Test Level (TL-3 or TL-4) tested on a slope of 6:1 or steeper. Provide a FHWA Eligibility Letter for a MASH tested TL-3 or TL-4 HTCB system with 4 cables tested on a slope of 6:1 or steeper. The submitted system shall have MASH tested TL-3 or TL-4 terminals.~~
- ~~4.2.~~ Submit documentation based on passed MASH Test 3-11 at minimum and maximum tested post spacing showing that proposed cable barrier post spacing meets the plan deflection requirements.
- ~~2.3.~~ The cable may not be tied to any guardrail or bridge structure but must be “overlapped” in a manner approved by the Engineer.
- ~~3.4.~~ Provide manufacturer’s drawings, general notes, specifications and installation manuals for all components proposed for installation.
- ~~4.5.~~ Provide manufacturer’s guidelines and instructions for repairs that may be required to the cable system and all appurtenances following a vehicle hit.
- ~~5.6.~~ Submit material specifications and technical data information on all materials proposed for use on the project.
- ~~6.7.~~ The design of the cable system termini, depth and size of line posts, concrete footings, and the concrete end-anchors shall bear the seal of a Registered Professional Engineer currently licensed in West Virginia.
- ~~7.8.~~ Provide an Installation Plan, with schedule, for the barrier. The Installation Plan shall be linked to the Transportation Management Plan for the project and shall be subject to the approval of the Engineer.
- ~~8.9.~~ Detailed drawings of all post and hardware including a post with all four (4) cable heights defined and construction tolerances to be met.
- ~~9.10.~~ Two (2) sets of As-Built plans shall be submitted showing the locations of the turnbuckles and ~~splice-splice~~ locations of the complete project.
- ~~10.11.~~ The complete foundation design for all Cable End Terminal Foundations shall be submitted to the Engineer. The design shall provide detailed reinforcement layout, dimensions and material properties defined as a minimum. Plans must be sealed by a Registered Professional Engineer licensed in West Virginia.
- ~~11.12.~~ Line Post Foundations shall be designed and the report submitted with the Cable End Terminal Foundation Report.~~when geotechnical soil conditions are not met as required by the HTCB manufacturer’s standard criteria.~~
- ~~12.13.~~ Blank Sample of the proposed Cable Tension Log are to be submitted upon completion.

607.2.4-Design Criteria: Base the minimum design load for the Cable End Terminal to cable connections on the theoretical cumulative tension expected at -20 degrees Fahrenheit.

Limit Cable End Terminal foundation lateral deflection to 1 inch at the proposed ground surface using a minimum factor of safety of 2.0.

607.2.5-Preconstruction Conference: A Preconstruction Conference with all parties shall be held at least 30 days prior to commencement of the work to install the barrier system. At that time, all materials and methods must have been approved by the Engineer.

607.4-ERECTING RAIL ELEMENTS:

ADD THE FOLLOWING TO THE SUBSECTION:

607.4.1-High Tension Cable Barrier System: The cable barrier system and end terminals shall consist of pre-tensioned wire rope (cable), steel line posts set in steel sockets in concrete footings, end-anchors and all fittings meeting ~~National Cooperative Highway Research Program (NCHRP) Report 350 or~~ MASH for Test Level 3 or Test Level 4.

~~Regardless of the Letter of Eligibility from FHWA for the 4 cable system, the maximum post spacing shall be 10.5 feet. The furnished HTCBB System shall provide MASH 2016 testing results of deflections of minimum and maximum post spacing. The maximum allowable deflection shall be nine (9) feet.~~

Any additional cost associated with meeting plan deflection requirement including reducing the post spacing or adding Cable End Terminals and Cable End Terminal Foundations will be considered incidental to construction.

The manufacturer of the cable system must have been in operation for at least 3 years and must have successfully installed a minimum of ~~50-10~~ miles of MASH High Tension Cable Systems in the United States. The manufacturer shall present evidence of such to the Engineer at the barrier system preconstruction conference.

The cable barrier system shall be designed so that line post repairs following a vehicle hit can be made quickly by two maintenance technicians using ~~readily available hand tools the HTCBB Tool~~. In addition, the cable barrier manufacturer shall provide written repair instructions for all elements of the cable system including the cables, anchors, and connections. All repair instructions shall be provided in an electronic version and in a printed and bound version (minimum 2 copies).

607.4.2-Construction Methods:

607.4.2.1-Installation of the Cable Barrier Line Posts: Any grading and excavation shall be completed to finished line and grade prior to installation of the ~~line posts-mow strip~~.

Excavate for line posts in accordance with the approved manufacturer's drawings. Each post shall be at the proper location, elevation, alignment and depth as proposed and approved. Excavation of line post footings shall be performed to place concrete, as required by the manufacturer, in undisturbed soil for the bottom and sides. In the event backfill is necessary, specification procedures must be followed to achieve the proper backfill method and compaction. Size and depth of footings shall be as approved by the Engineer but shall not be less than 14" diameter and 36" deep (14"x36") unless larger sizes are recommended by the manufacturer and approved by the Engineer.

The galvanized steel line post sleeves shall be placed in concrete footings in accordance with the approved manufacturer's drawings. ~~Footings shall have reinforcing bars in accordance with the manufacturer's approved shop drawings.~~

The line post footings shall be compatible with a concrete mow strip, as called for in the plans, ~~and shall be separated by expansion material sufficient to protect both from cracking.~~

The line posts shall be set in the line post sleeves paying close attention to the horizontal and vertical alignment of the posts. It is critical that the posts be set to achieve the proper wire rope height. Line posts shall be set to achieve the vertical and horizontal tolerances set by the manufacturer in the approved shop drawings and installation manuals. Posts and foundations not set at the proper line and grade shall be replaced prior to the installation of the wire rope.

607.4.2.2-Installation of End Terminals: Install terminals in conformance with the requirements of the cable system manufacturer's instructions and as approved by the Engineer.

End terminals shall be placed in excavations of ~~natural, existing~~, undisturbed ground, to size and shape required by the manufacturer based on soil types and ground conditions. If over-excavation is unavoidable as verified by the Engineer prior to installation of the concrete, the sides must be vertical and additional concrete shall be used to fill completely the excavated area.

Provide an end terminal for each separate connection for each separate run of cable. Cables shall not be tied to anything but an approved terminal and shall not be tied to any proposed or existing guardrail, bridge structure or other unapproved object.

~~No incomplete runs subject to traffic shall be left overnight or unprotected. At the end of each working day, any section started shall be completed by the end of the day if the roadway is under traffic. No incomplete runs subject to traffic shall be left overnight or unprotected. remain incomplete more than 24 hours.~~

Any end-anchor movement exceeding 1 inch within twelve (12) months of complete installation will require re-construction and re- tensioning of the system by the Contractor at their cost as directed by the Engineer.

607.4.2.3-Installation of Wire Rope: The wire rope shall be installed at the elevation and proper height as approved in the manufacturer's design and approved drawings.

Tension shall be applied meeting manufacturer's recommendations. Check the tension per manufacturer's recommendations.

~~Three weeks following the initial tensioning, check and adjust the tension as necessary. No additional compensation will be provided for any subsequent tensioning required.~~

Maintain a tension log showing time, date, location, cable temperature, ambient air temperature and final tension reading, signed by the person performing the tension testing. The log will be reviewed to verify that the measured tension matches the temperature/tension chart provided by the manufacturer and is within the stated variance. The log shall be provided to the Engineer after tensioning is complete.

The number and location of splices will be subject to the approval of the Engineer. Splices shall be staggered in accordance with the manufacturer's recommendations. Cable splices shall be made in accordance with the recommendations of the cable manufacturer.

607.4.3-Maintenance During Construction: Once the cable system has been erected the cable and that section of roadway returned to traffic, the Contractor is responsible for maintaining and repair of the cable barrier system until final acceptance of the entire project. Should the cable barrier be damaged by the traveling public, Contractor shall repair the barrier within 24 hours. The cable barrier posts shall be replaced and the cable reinstalled to the post.

If that section of cable has been inspected and certified to by the manufacturer, the cable will be re-inspected and recertified as with the initial installation.

All repairs made to the cable barrier or terminals, no matter the cause of the repair, prior to final acceptance, shall be considered incidental to construction at no additional cost to the ~~contract~~Division.

607.4.4-Cable System Installation Training and Certification:

607.4.4.1-Contractor's Certification: A manufacturer's representative shall be present during the installation of the first section of the cable barrier system and shall supervise installation of all components (i.e. posts, anchors, tensioning). Upon completion of the entire system, a manufacturer's representative shall inspect and the Contractor shall certify in writing that the cable system was installed in accordance with the manufacturer's design and requirements.

~~**607.4.4.2-On Site Installation Training-Certified Contractor Personnel:** All training shall be provided by the cable system manufacturer. Provide a minimum of 2 hours of classroom training on the installation of the system. This training shall be provided at the WVDOT District Office responsible for the construction of the system. The location and time of this training shall be subject to the approval of the Engineer. Provide on-site field instruction using a minimum 2000 foot section of the system. The amount of training will be as necessary to provide the field training on all aspects of system installation, line post installation, wire rope installation and tensioning and testing, and terminal installation. The contractor shall submit certification Provide Certification by the manufacturer of the system for the contractor's supervisors. Participants of the training. This certification shall require participants to pass a written examination prepared and given by the system manufacturer. The Contractor shall have a minimum of one certified personnel on the site at all times during the installation of all elements of the system. The training and certification instruction described above shall be provided for a minimum of twenty participants to include the Contractor, WVDOT (Construction, Maintenance and Traffic Operations personnel) and FHWA. Twelve slots shall be reserved for WVDOT and FHWA and the remainder for the Contractor.~~

607.4.4.3-Training Following Installation: Provide a minimum of two hours of classroom instruction on the maintenance and repair of the cable system. This training shall be provided at ~~the a~~ WVDOT District office, responsible for maintenance, as designated by the Engineer. The scheduling and location of this training shall be as approved by the Engineer.

Provide a minimum of one hour of on-site instruction on the maintenance and repair of the system.

A training session of two hours shall be provided to address the needs of emergency response personnel involved in extricating vehicles from the cables and the safety of the responders with techniques in minimizing damage to the system.

The training shall be for a maximum of 20 participants including WVDOT (Construction, Maintenance, and Traffic Operations), FHWA and representatives of local fire and rescue services.

607.6-METHOD OF MEASUREMENT:

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

The quantity of HTCB will be measured in feet along the top cable constructed, tested and accepted. Each segment of HTCB shall be between Length of Need (LON) points as shown on the plans. The measured length between LON points shall pay for all 4 cables of the system, line posts, line post foundations and appurtenances. The length of the End Terminals outside of the LON shall not be included in this measurement. The approved shop drawings shall define the location of the LON point of the system.

The quantity of Cable End Terminals and Cable End Terminal Foundations to be paid for shall be the bid quantity. Added Cable End Terminals and Cable End Terminal Foundations will not be directly paid for and all cost of these shall be incidental to the original bid quantity, and shall be constructed as shown by the details in the plans.

The hours of training will be the hours of the instructor providing the training as directed by the Engineer.

The HTCB, Cable Repair Tool shall be the required tool necessary to manage the tensioned cables and separate the cables as required for the replacement of damaged posts; will be measured per each.

607.7-BASIS OF PAYMENT:

ADD THE FOLLOWING TO THE SUBSECTION:

The quantities of HTCB Repair Materials will be measured and paid for at the contract unit prices bid for the items listed below, which prices and payments shall constitute full compensation for furnishing, packing and delivering to the designated site(s) and any other incidentals necessary for the Division to take delivery of the repair materials.

607.8-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
607018-001	High Tension Cable Barrier (HTCB)	Linear Foot
607018-005	Cable End Terminal	Each
607018-010	Cable End Terminal Foundation	Each
607018-040	Line Post with Hardware-Materials Only	Each
607018-042	Cable End Terminal-Materials Only	Each
607018-044	Cable Splice-Materials Only	Each
<u>60718-048</u>	<u>HTCB Tool, "Equipment"</u>	<u>Each</u>
607018-050	HTCB Installation & Maintenance Training	Hour
<u>"Equipment"</u>	<u>Supplemental description to designate type of tool (i.e. – Tension Meter, Cable Repair Tool, etc.)</u>	

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 105
CONTROL OF WORK**

105.4-COORDINATION OF PLANS, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS:

These Specifications, the Supplemental Specifications, the Plans, Special Provisions, and all Supplementary Documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; Supplemental Specifications will govern over Specifications; Plans will govern over Specifications and Supplemental Specifications; Special Provisions will govern over Specifications, Supplemental Specifications and Plans. When the plans provide that new work is to connect with existing structures, the Contractor must verify all dimensions with the Engineer before proceeding with the work.

~~————The Specifications, Supplemental Specifications, and Special Provisions are in dual units. The first Primary unit is in English with the Metric unit following in parentheses “()”. The Metric values are considered replacements for the English units and they are not conversions.~~

The Contractor shall take no advantage of any apparent error or omission in the Plans or Specifications. In the event the Contractor discovers such an error or omission, the Contractor shall immediately notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Plans and Specifications.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 103

AWARD AND EXECUTION OF CONTRACT

103.6-INSURANCE REQUIREMENTS:

103.6.5-Countersignature of West Virginia Agent:

DELETE SUBSECTION 103.6.5.

~~**103.6.5-Countersignature of West Virginia Agent:** The policy or policies of Insurance required must be countersigned by an Agent Licensed in West Virginia, in accordance with the applicable statute of the State of West Virginia.~~

~~All certificates of insurance used to verify the policies issued must be endorsed by an Agent Licensed in West Virginia. Such endorsement must include the printed name, street address, city, zip code and West Virginia license number of the Agent.~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107.8-RAILWAY-HIGHWAY PROVISIONS:

107.8.2-Insurance:

107.8.2.2-Railroad Protective Liability Insurance:

DELETE THE CONTENTS OF SUBSECTION 107.8.2.2 AND REPLACE THE FOLLOWING.

With respect to the operations performed by the Contractor or subcontractors of any tier the Contractor must provide in the name of Railroad. This policy shall be written on the ISO/RIMA Form of Railroad Protective Insurance (ISO Form CG00350690) with Pollution Exclusion Amendment ISO Form CG 28311185 or their equivalents). ~~The policy of insurance specified in this section shall be countersigned by a resident agent of the State of West Virginia in accordance with Section 103.6.5.~~ The original of the policy shall be submitted to and approved by the Railroad before work is commenced on its right of way or within 200 feet of the nearest track or 1000 feet if blasting is required for the construction.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 108

PROSECUTION AND PROGRESS

108.7-COMPLETION DATES:

108.7.2-Interim Completion Date:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

When an interim completion date has been specified in the Contract documents for the Contractor to complete a specific amount of work, pay item, or structure, and if the Contractor fails to meet the interim date, the Division will assess a per calendar day charge as liquidated damages, as specified in Section 108.7.1, unless otherwise specified elsewhere in the Contract documents, until such amount of work, pay item, or structure has been completed. Extension of interim completion dates will be governed by the provisions of 108.6. The liquidated damages provided for in this subsection are in addition to those provided for elsewhere in this Section.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 219

CONTROLLED LOW-STRENGTH MATERIAL

219.4-CONSTRUCTION MEHTODS:

219.4.1-Proportioning:

ADD THE FOLLOWING PARAGRAPH AFTER THE FOURTH PARAGRAPH OF THE SUBSECTION:

A pH test, in accordance with ASTM G51, shall be performed on at least one sample during the mix design testing, and the results shall meet the requirements of Section 219.3.

219.4.2-Testing:

DELETE THE FIRST PARAGRAPH OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Material shall be sampled in accordance with ASTM D5971. ~~The pH tests shall be conducted in accordance with ASTM G51.~~ Flow tests shall be conducted in accordance with ASTM D6103. Compressive strength tests shall be conducted in accordance with ASTM D4832.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 501

PORTLAND CEMENT CONCRETE PAVEMENT

501.5-EQUIPMENT AND TOOLS:

501.5.2-Batching Plant Equipment:

501.5.2.3-Scales:

DELETE THE SECOND PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Scales shall be inspected and sealed as often as the Engineer ~~may~~ deems necessary to ~~assure~~ensure their continued accuracy, and as outlined in MP700.00.30. The Contractor shall have on hand not less than ten 50 pound (22.68 kg) test weights for frequent testing of all scales.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 601
STRUCTURAL CONCRETE**

601.5-EQUIPMENT AND TOOLS:

601.5.2-Batching Plant And Equipment:

601.5.2.3-Scales:

DELETE THE SECOND PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Scales shall be inspected and sealed as often as ~~may be the Engineer~~ deemed necessary to ~~ensure~~ assure their continued accuracy. The Contractor shall have on hand not less than ten 50 lb. (~~2022.68~~ kg) weights for frequent testing of all scales.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 609 SIDEWALKS

609.1-DESCRIPTION:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE THE FOLLOWING.

This work shall consist of the construction of Portland cement concrete sidewalks and curb ramps in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Plans or established by the Engineer.

609.2-MATERIALS:

609.2.1-Detectable Warning Surfaces:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE THE FOLLOWING.

Detectable warning panels shall have a detectable warning surface meeting Proposed Accessibility Guidelines for Pedestrian Facility in Public Right of Way (PROWAG), latest edition, requirements. The panel dimensions shall not deviate more than 1/16 in (3 mm). The panel colors shall be as shown in the plans or as approved by the Engineer. ~~The color shall contrast to the adjacent sidewalk, sidewalk flares and pavement. The panel shall contrast visually with adjacent gutter, street or highway, or curb ramp surface, either light-on-dark or dark-on-light.~~ The panels shall maintain a minimum skid resistance of 0.60 wet when tested with ASTM C 1028.

There shall be two types of warnings surfaces: panels for fresh concrete surfaces while the concrete is still plastic and products-panels for cured concrete surfaces. ~~A wet or plastic set in place system shall be installed at the time of the placement of the sidewalk, while the concrete is still plastic.~~ Mold-in-place concrete domes, brick pavers, tiles, or iron or steel warning systems shall not be used. Products-Detectable warning panels must be approved and on the WVDOH Approved Products List. The material approval for detectable warning panels will be based on results from WVDOH field evaluation tests. ~~Detectable warning systems may also be accepted or rejected or~~ based on actual performance on WVDOH projects. All materials to be used shall be covered by a 5 year manufacturer warranty under normal conditions.

609.3-SUBGRADE PREPARATION:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING.

The subgrade shall be constructed true to grade and cross section as shown on the Plans or directed by the Engineer. It shall be watered, if required, and thoroughly compacted before placing the concrete or bed course material. All soft ~~and-or~~ yielding material shall be removed and replaced with suitable material.

609.6-MIXING AND PLACING CONCRETE:

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION.

Curb ramp and adjacent curb or curb and gutter may be constructed monolithically, with the approval of the Engineer. The monolithic or integral curb ramp threshold and adjacent curb are required to be poured at the proper depth as per PVT-6.

609.7-EXPANSION JOINTS:

DELETE THE THIRD PARAGRAPH AND REPLACE WITH THE FOLLOWING.

Expansion Joints shall be provided around all ~~sidewalk-curb~~ ramps and ramp flares.

609.8-FINISHING:

609.8.1-Concrete:

DELETE THE THIRD PARAGRAPH AND REPLACE WITH THE FOLLOWING.

The surface of sidewalks shall be marked into rectangles of not less than 12 sq. ft. (1 sq. m) with a scoring tool which will form ~~dummy-contraction~~ joints and rounded sidewalk edges. The ~~dummy-contraction~~ joints shall extend into the concrete 1 inch (~~9-25~~ mm) depth and shall be approximately 1/8 inch (3 mm) wide.

609.8.2 Detectable Warning Surface:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING.

All curb ramps shall include detectable warning surface across the full width of the curb ramp where the flush threshold meets the gutter or pavement (excluding any flared sides) or as shown on the plans or established by the Engineer. ~~The detectable warning panels may be designed for placement while the concrete is plastic or after the concrete has cured. A wet or~~

~~plastic-set-in- place anchored detectable warning surface system shall be installed at the time of the placement of the sidewalk curb ramp, while the concrete is still plastic. The sidewalk concrete shall cure a minimum of 72 hours prior to placement of the detectable warning surface. The area where the surfaces are to be installed in shall be thoroughly cleaned and allowed to dry. The panel shall contrast visually with adjacent gutter, street or highway, or curb ramp surface, either light-on-dark or dark-on-light. A concrete border, if necessary for installation, shall not exceed 2 inches. Detectable warning surfaces are intended to provide a tactile equivalent underfoot of the visible curb line. If detectable warning surfaces are placed too far from the curb line because of a large curb radius, the location may compromise effective crossing. Detectable warning surfaces should be placed at the back of the curb line (or as shown on the plans or established by the engineer) and shall not be placed on paving or expansion joints. A single detectable warning surface panel shall be used with curb ramp widths of 5 feet or less. Where detectable warning surface panels are cut to conform to a specific shape of ramp and anchoring devices become part of the waste, the anchor will be removed and reattached into the detectable warning surface at the original edge offset as per manufacturer. The joints between the panels shall not exceed 1/8 inch. The panels shall not deviate more than 1/16" from the finished grade of the ramp surface. The grade will be measured from the top of the panel excluding any texture. The panels shall be installed and cut as recommended by the manufacture. Where parts of more than one panel are used to conform to a specific shape, all panel pieces shall be of the same color. Where possible, the~~ domes shall be aligned in the direction of pedestrian travel.

609.9-METHOD OF MEASUREMENT:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING.

Sidewalks will be measured in square yards (meters), complete in place and accepted, which will be determined by the length measured upon the surface times the width constructed, as authorized by the Engineer. Removal of existing sidewalks and any excavation shall be considered Unclassified Excavation and shall be paid as specified in Section 207. ~~Detectable warning surfaces shall be measured and paid for separately complete in place and accepted. Sidewalk B~~ed course material will be measured by the cubic yard (meter), complete in place and accepted.

Curb Ramps will be measured and paid for separately complete in place and accepted. Curb Ramp item includes and all concrete for curb ramp (including curb, curb and gutter, curb wall or cheek wall, etc.) as shown in Standard Details. Removal of existing curb ramp, existing partial sidewalks necessary for curb ramp replacement, and any excavation shall be incidental. Curb Ramp bed course material will be measured by cubic yard, complete in place and accepted on new curb ramp construction. Detectable warning surfaces shall be measured and paid for separately complete in place and accepted.

Where a driveway crosses a sidewalk, the intersecting area shall be constructed to the driveway typical section and shall be measured and paid for the entire length of the driveway and transitions by the pay items shown in the driveway typical section or the Standard Details.

609.10-BASIS OF PAYMENT:

609.10.1-Price Adjustment:

DELETE THE FIRST SENTENCE OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING.

Bed course material not conforming to the gradation requirements as described in 609.2.5.1 will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 609.10.1.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 622
TIMBER BRIDGE STRUCTURES**

622.1-GENERAL:

622.1.2

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

Type F: Nail Laminated Transverse Timber Deck. This deck type consists of nail laminated, transverse, treated, dimensional lumber oriented on the strong axis and held in place by nails and steel nailing clips at Plan specified intervals and sizes.

622.2-MATERIALS:

622.2.1-Stress Laminated Plank Deck, Solid Sawn Curbs, Guardrail Posts and Guardrail:

DELETE THE TITLE AND CONTENTS OF SUBSECTION 622.2.1 AND REPLACE WITH THE FOLLOWING:

622.2.1-Stress Laminated Plank Deck, Nail Laminated Deck, Solid Sawn Curbs, Guardrail Posts and Guardrail: All structural lumber used in the bridge construction will be Northern Red Oak except when Structural Glued-Laminated Timber is specified on the Plans.

All lumber and timber shall be graded in accordance with the Standard Grading Rules for Northeastern Lumber, as published by the Northeastern Lumber Manufacturer's Association Incorporated (NELMA), 272 Tuttle Road, P.O. Box 87A, Cumberland Center, Maine 04021, Telephone # (207) 829-6901.

Lumber for stress-laminated plank decks and nail laminated decks shall be # 3 Grade or better except wane shall meet # 1 Grade, as specified in the above grading standards Section 20.0 for Structural Joists and Planks. Grading may be performed after rough sawing to approximate dimensions; however crook shall meet the grading rules after preservative

treatment. Stress-laminated deck lumber shall be sawed, surfaced two sides (S2S), resawed or otherwise processed so that the resulting fit between adjacent planks will meet the applicable Manufacture-Standard as defined by the NELMA grading rules for the faces.

The thickness of planks shall be from 1-½ inches (40 mm) through 2 inches (50 mm) with only one size to be used in a bridge deck. Stress-laminated deck lumber shall contain not less than 12% nor more than 19% moisture (oven dry basis) after preservative treatment and prior to fabrication. Moisture content is to be confirmed in accordance with AWP A6, using a minimum sample size of 40 cores per lot of deck lumber taken at random throughout the lot. The length of each core sample shall be one-half the thickness of the deck plank.

Timber for guardrail posts and blockouts, curbs, curb blocks, and guardrail when specified on the Plans shall be "# 2 Grade" or better as specified in the above grading standards Section 25.0 for Beams and Stringers. Material may be rough saw cut to the approximate dimensions shown on the Plans so that after conditioning and preservative treatment the actual dimensions are within plus or minus 3/16 inch (5 mm) of plan cross sectional dimensions.

All lumber and timber shall be graded, approved and stamped or tagged by a lumber grader, certified by an agency who has been approved by The Board of Review of the American Lumber Standards Committee.

All dimensions shown on the Plans for structural lumber shall be actual dimensions.

When structural glued-laminated timber members or nail laminated decks are specified on the Plans they shall meet the requirements of Section 622.2.6. Nail laminated decks shall use 20 penny coated sinker nails and the galvanized deck anchor plate nailing clips shall be manufactured with a minimum of 11 gage steel and a maximum of 10 gage and be sized in accordance with the applicable plan sheets. The coated sinker nails shall be compatible with treated timber.

622.5-CONSTRUCTION METHODS:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Stress-laminated, nail laminated, and structural glued-laminated timber bridges or decks are to be fabricated and erected in accordance with the Plans and these specifications.

622.5.5-Modular Construction:

DELETE THE CONTENTS OF SUBSECTION 622.5.5 AND REPLACE WITH THE FOLLOWING:

When specified on the Plans the bridge will be fabricated and erected using modular techniques as described below. The applicable provisions of 622.5.1 through 622.5.4 also apply to modular fabrication and erection. Modular construction does not apply to Type D, E, and F bridges.

622.5.5.4-Handling, Shipping and Erection:

ADD THE FOLLOWING TO THE END OF SUBSECTION 622.5.5.4:

Field nailing to any treated bridge component is prohibited with the exception of Type F deck. Type F deck shall be nailed in accordance with the Plans.

622.6-METHOD OF MEASUREMENT:

ADD THE FOLLOWING SUBSECTION:

622.6.4.1-Nail Laminated Timber Deck: The quantity of work done will be measured in ~~linear-cubic~~ feet (ft) which is based on actual dimensions of timber deck placed as called for by the plan sizes and quantities as show on the Plans and shall include nails and nailing clips complete and in place and accepted in the finished structure.

There will be no direct payment for the quantity of waste lumber to construct the deck as called for by the plans.

622.8-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
622015-*	Nail Laminated Timber Deck, Type F	Linear- <u>Cubic</u> Foot

* Sequence Number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 636 MAINTAINING TRAFFIC

636.23-METHOD OF MEASUREMENT:

DELETE THE CONTENTS OF SUBSECTIONS 636.23.8, 636.23.9, AND 636.23.10 AND REPLACE WITH THE FOLLOWING:

636.23.8-Eradication of Pavement Marking: The quantity of "Eradication of Pavement Markings" shall be the equivalent linear-square feet (meters) of ~~4 inches (100 mm) solid line~~ actually line, symbol, and arrow material removed from the pavement. ~~As an example, an 8 inches (200 mm) solid line would double the linear quantity.~~ Quantity calculations shall be based on design widths of markings and the following tables, and shall not be based on field measurements of actual line widths which may be slightly less or greater than the design width due to overspray or spray guns being slightly out of adjustment. Additional quantity shall not be added for additional effort required for removal of remnants of previously applied markings left exposed due to non-precise retracement.

<u>Description</u>	<u>Value of Square Feet</u>
<u>Edge Lines, Lane Lines, Centerline, Channelizing Lines, Stop and Crosswalk Lines, Stripes, Curb and Island Markings</u>	
<u>6-inch Line</u>	<u>= # of feet of 6-inch line removed / 2</u> <u>Example: 10 feet of 6-inch line removed / 2 = 5 SF</u>
<u>8-inch Line</u>	<u>= # of feet of 8-inch line removed / 1.5</u> <u>Example: 10 feet of 8-inch line removed / 1.5 = 6.7 SF</u>
<u>12-inch Line</u>	<u>= # of feet of 12-inch line removed x 1</u> <u>Example: 10 feet of 12-inch line removed x 1 = 10 SF</u>
<u>24-inch Line</u>	<u>= # of feet of 24-inch line removed x 2</u> <u>Example: 10 feet of 24-inch line removed / 2 = 5 SF</u>

<u>Description</u>	<u>Standard Detail Sheet *</u>	<u>Value of Square Feet</u>
<u>Symbol Markings</u>		
<u>Yield Triangle</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>2.8</u>
<u>Handicapped Symbol</u>	<u>TEM-5</u>	<u>16.0</u>
<u>Bicycle Symbol</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>6.0</u>
<u>Arrows</u>		
<u>One Direction (Left/Right Turn) Arrow</u>	<u>TEM-3 (sh 1 of 3)</u>	<u>17.0</u>
<u>Straight Arrow</u>	<u>TEM-3 (sh 1 of 3)</u>	<u>12.0</u>
<u>Multi Direction Arrow</u>	<u>TEM-3 (sh 1 of 3)</u>	<u>29.0</u>
<u>Wrong Way Arrow</u>	<u>TEM-3 (sh 1 of 3)</u>	<u>24.0</u>
<u>Lane Drop Arrow</u>	<u>TEM-3 (sh 1 of 3)</u>	<u>42.0</u>
<u>Roundabout with One Arrow, LE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>28.0</u>
<u>Roundabout with One Arrow, TE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>31.0</u>
<u>Roundabout with One Arrow, RE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>15.0</u>
<u>Roundabout with Multiple Arrows, LTRE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>43.0</u>
<u>Roundabout with Multiple Arrows, LRE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>36.0</u>
<u>Roundabout with Multiple Arrows, LTE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>39.0</u>
<u>Roundabout with Multiple Arrows, TRE</u>	<u>TEM-3 (sh 3 of 3)</u>	<u>39.0</u>
<u>Lane Letter</u>		
<u>“R X R”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>59.0</u>
<u>“SCHOOL”</u>	<u>8 ft height FHWA Standard Highway Signs and Markings book lettering**</u>	<u>34.0</u>
<u>“X-ING”</u>	<u>8 ft height FHWA Standard Highway Signs and Markings book lettering**</u>	<u>21.0</u>
<u>“ONLY”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>22.0</u>
<u>“STOP”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>23.0</u>
<u>“RIGHT”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>26.0</u>
<u>“LEFT”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>20.0</u>
<u>“TURN”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>24.0</u>
<u>“LANE”</u>	<u>TEM-3 (sh 2 of 3)</u>	<u>24.0</u>
<u>“YIELD”</u>	<u>8 ft height FHWA Standard Highway Signs and Markings book lettering**</u>	<u>24.0</u>

* WVDOH Standard Details Vol. II, latest edition

** Marking not included in the Standard Details

636.23.9-Temporary Pavement Markings-Paint: The quantity of “Temporary Pavement Markings-Paint” shall be the linear feet of ~~4 in. (100mm)~~, 6 in. (150 mm); or 8 in. (200 mm) solid line actually placed on the pavement.

636.23.10-Temporary Pavement Markings-Tape: The quantity of “Temporary Pavement Markings-Tape” shall be the linear feet of ~~4 in. (100mm)~~, 6 in. (150 mm); or 8 in. (200 mm) solid line actually placed on the pavement.

636.25-PAY ITEMS

DELETE ITEM 636007 “ERADICATION OF PAVEMENT MARKINGS” AND REPLACE WITH THE FOLLOWING:

~~July 8, 2020~~ September 22, 2020

ITEM	DESCRIPTION	UNIT
636007-*	Eradication of Pavement Marking	Linear <u>Square</u> Foot (Meter)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**DIVISION OF HIGHWAYS****SUPPLEMENTAL SPECIFICATIONS****FOR****SECTION 642
TEMPORARY POLLUTION****642.2-MATERIALS:**

Materials will be considered acceptable when they are capable of accomplishing the intended purpose, do not in themselves contribute to pollution and comply with the following:

- i. Mulches may be hay, straw, wood cellulose fiber, wood chips, bark, matting or other material acceptable to the Engineer. Mulch materials shall be reasonably free of noxious weeds. ~~Asphalt for anchoring hay or straw mulch shall be of a commercial grade.~~ Chemical mulch binders shall conform to the requirements in 715.27.1.
- ii. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other material that will adequately control erosion and is acceptable to the Engineer.
- iii. Temporary seed, such as annual ryegrass (Italian ryegrass), weeping lovegrass, cereal rye or wheat, barley or oats, and millet, used in temporary seed mixture or seed mixtures B or D, shall be of a commercial grade meeting requirements of the State Seed Law, Temporary seed labeled with the notation "germination below standard" will not be acceptable for use on projects. Temporary seed shall not be used on the project after one year from the date of germination test shown on the label. Seed other than that specified above shall meet the requirements of 715.28.
- iv. Fertilizer shall be a commercial grade of 1-2-1 ratio, meeting requirements of the governing state and federal laws.
- v. Others as shown on the Plans or specified by the Engineer (i.e. Temporary Pipe, Temporary Structures, etc.).
- vi. Ground agricultural limestone shall be of a commercial grade.
- vii. Engineering fabric for silt fence shall meet the requirements of 715.11.5 and have a minimum width of 3 feet (900 mm). Wood, steel, or synthetic support posts having a minimum length of 3 feet (900 mm) plus the burial depth shall be used. They shall be of sufficient strength to resist damage during installation and to the support applied loads due to material or water build up behind the silt fence.
- viii. Dewatering Device shall meet the requirements of 715.11.10.

642.5-SEEDING AND MULCHING:

642.5.4-Mulch, Fertilizer and Lime: Mulching, fertilizing and liming shall be in accordance with the following requirements:

- i. Two tons per acre (4.5 Mg per ha) of straw or hay mulch shall be applied on slopes of 1½ to 1 or flatter. ~~Asphalt material to anchor the mulch shall be used at the rate of 50 gallons per ton (210 L per Mg) of straw or hay mulch.~~ Other types of chemical mulch binders may be used; ~~in lieu of asphalt material.~~ These mulch binders shall be applied according to the manufacturer's specifications ~~through the asphalt spray system or by agricultural crop sprayer.~~
 Wood cellulose fiber mulch shall be applied on slopes steeper than 1½ to 1 at the rate of 1,500 lb. per acre (1 680 kg per ha).
 Fertilizer shall be applied at the rate of 800 lb. per acre (900 kg per ha) of 10-20-10 fertilizer or equivalent.
 Lime application rate will be determined by the Engineer based upon pH test conducted in accordance with MP 700.04.10.
- ii. Wood chips, recovered from clearing and grubbing operations, or bark will be acceptable as a mulch for seeding and shall be used at a rate of 35 cubic yard per acre (66 cubic meters per hectare) in lieu of straw or hay.
- iii. Mulch Alone - For embankments or cuts 1½ to 1 or flatter, susceptible to critical erosion during periods of cold weather, the Engineer may require a two ton per acre (4.5 Mg per ha) application of straw or hay mulch for temporary erosion control and later seeding. ~~Asphalt for anchoring mulch shall be at the rate of 50 gallons per ton (210 L per Mg) of mulch.~~ The straw or hay may be rolled immediately with a sheep foot roller to anchor the mulch ~~in lieu of using asphalt.~~ A chemical mulch binder may be used for anchoring mulch in accordance with the provisions in paragraph i. above.
 When the weather becomes favorable in the spring, these areas shall be seeded using the normal application rates of seed, fertilizer and lime. If additional mulch is needed, wood cellulose fiber, hay or straw shall be used; the rate of application and areas to be mulched with wood cellulose fiber, hay or straw shall be as determined by the Engineer.

642.7-METHOD OF MEASUREMENT:

The work will be measured for payment at the unit bid prices for the items specified in 642.9.

Berms constructed prior to suspension of construction operations and slope drains will be measured in linear feet (meters); check dams will be measured by the unit; sediment traps, ponds, or dams and sediment removal will be measured by the cubic yard (meter); for sediment dams, risers will be measured by the unit and conduit for principal spillway under the dam will be measured in linear feet (meters) and included under Item 642008-*; seed will be measured by the pound (kilogram); straw, hay and wood cellulose fiber mulch will be measured by the ton (megagram); wood chips or bark mulch will be measured by the cubic yard (meter); fertilizer and agricultural limestone will be measured by the ton (megagram); matting will be measured by the square yard (meter); contour ditching will be measured by the linear foot (meter). Measurements will be made on the surface of the work done when applicable. ~~Asphalt for anchoring~~ for mulch or other chemical binders will not be measured separately, but their cost shall be included in the unit price bid for mulch. Cereal rye or cereal wheat added to Type D mixture in fall seeding will not be included for payment but its cost shall be included in the unit prices in 642.9.

Temporary pipe will be measured by the linear foot (meter) complete and in place. If the Contractor elects to utilize a series of small pipes in lieu of one large pipe, measurement for

payment will be made only for a length necessary to extend one conduit under the haul road or sediment dam.

Berms constructed at the end of each day's operation will not be measured for payment but their cost shall be included in the unit bid price for Item 207001-*, "Unclassified Excavation."

Ditch checks will be measured by the unit.

Dewatering Device will be paid per each device used.

Wood chips or bark will be measured by the cubic yard (meter). It is assumed that 17.5 cubic yards (14.75 cubic meters) of chips or bark are equal to one ton (megagram) of straw for seeding. Wood chips or bark mulch will be measured by the truck load or other loose volume measurement, and payment will be made on a one ton (megagram) equivalent of straw for each 17.5 cubic yards (14.75 cubic meters) of wood chips or bark mulch.

Quantities reseeded, refertilized, or remulched will be measured and included for payment.

The bid price for fertilizer shall be based on 10-20-10 ~~typeratio~~. When other ~~types-ratios~~ of fertilizer are used, pay quantities will be determined using the following table:

Type of Fertilizer	Actual Quantity Used Pounds (kg)	Pay Quantity Pounds (kg)
5-10-5	100	50
8-16-8	100	80
10-20-10	100	100
12-24-12	100	120
15-30-15	100	150

When fertilizer ~~types-ratios~~ other than those shown above are used, the relationship between the pay quantity and the actual quantity used will be established by the Engineer.

Silt fence will be measured by the linear foot (meter) at the bottom of the fence, excluding laps. Decomposed or ineffective fabric in the silt fence which is required to be replaced after six months from the installation date will be measured and paid for, however, such replacement prior to six months after installation will not be measured for payment.

In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, or as ordered by the Engineer, such work shall be performed by the Contractor at their own expense. Temporary erosion and pollution control work required, which is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, shall be performed as ordered by the Engineer. Where the work to be performed is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls and falls within the Specifications for a work item that has a contract price, the units of work will be paid for at the proper contract price. Should the work not be comparable to the project work under the applicable contract items, the Contractor shall perform the work in accordance with 104.3.

In case of repeated failure on the part of the Contractor to control erosion, pollution, or siltation, the Engineer reserves the right to employ outside assistance or to use their own forces to provide the necessary corrective measures. Such incurred direct costs plus project engineering costs will be charged to the Contractor and appropriate deductions made from the Contractor's monthly progress estimate.

June 24, 2020

Temporary pollution control may include construction work outside the right-of-way where such work is necessary as a result of roadway construction such as borrow pit and waste site operations, haul roads and equipment storage sites.

Super Silt Fence will be measured by the linear foot complete and in place.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATIONS

FOR

SECTION 652 SEEDING AND MULCHING

652.2-MATERIALS:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Materials shall meet the requirements in the following Subsections of Division 700:

MATERIAL	SUBSECTION
Fertilizers	715.26
Ground Agricultural Limestone	715.25
Inoculating Bacteria	715.29
Matting for Erosion Control	715.24
Mulch Materials	715.27
Water	*

* Water shall be reasonably free from injurious chemicals and other toxic substances harmful to plant life. The source of water used is subject to the approval of the Engineer.

Temporary seed, such as annual ryegrass (Italian ryegrass) and weeping lovegrass, used in the seed mixtures B, C, or D, shall be of a commercial grade meeting the requirements of the State Seed Law. Temporary seed labeled with the notation "germination below standard" shall not be used. Temporary seed shall not be used after one year from date of germination test shown on the label.

Seed other than that specified above shall meet the requirements of 715.28.

~~Asphalt for anchoring mulch shall be of a commercial grade.~~ Chemical mulch binders shall conform to the requirements in 715.27.1.

Topsoil, if called for, shall conform to the requirements in 651. All materials will be subject to approval or rejection, in part or in whole.

652.6-APPLYING MULCH AND FERTILIZER:

652.6.2-Straw Mulch:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Straw shall be applied at the rate of approximately two tons per acre (4.5 Mg per hectare). ~~The straw mulch may be anchored with 100 gallons of asphalt per acre (93.5 L of asphalt per hectare). The asphalt may be sprayed on the straw as it leaves the blower or it may be applied in a separate operation. The Contractor shall be responsible for any damage to the structures from the asphalt spray.~~

Straw mulch around buildings, sidewalks or other structures may be held in place with a form of netting ~~or may be sprayed with asphalt by hand while protecting the structures from the asphalt spray.~~

~~Other types of chemical mulch binders may be substituted for asphalt material. These mulch binders shall be applied according to the manufacturers' specifications through the asphalt spray system or by an agricultural crop sprayer.~~

652.9-METHOD OF MEASUREMENT:

Ground agricultural limestone, fertilizer, and mulch will be measured by the ton (megagram). Seed will be measured by the pound (kilogram).

Wood chips or bark will be measured by the cubic yard (meter). It is assumed that 17.5 cubic yard (14.75 cubic m) of chips or bark are equal to one ton (megagram) of straw for seeding. Wood chips or bark mulch will be measured by truck load or other loose volume measurement, and payment will be made on one ton (megagram) equivalent of straw for each 17.5 cubic yard (14.75 cubic m) of wood chips or bark mulch.

Second and third step seeding operations will be measured and included for payment under items in 652.11.

~~Asphalt for anchoring mulch, or other e~~Chemical mulch binders, will not be measured separately, but their cost shall be included in the unit price bid for mulch.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 672
CONSTRUCT BUILDING**

ADD THE FOLLOWING SUBSECTION:

672.2-CONSTRUCT BUILDING:

The work shall be performed per the Building Specifications and the plans. Where a conflict exists with 105.4, the Building Specifications will govern over Specifications, Supplemental Specifications, Plans, and Special Provisions.

672.2.1–Method of Measurement: The quantity of work done will be measured by Lump Sum of “~~Site Furnishing Construct Building~~” complete in place and accepted.

672.2.2–Basis of Payment: The Contractor shall submit to the Engineer a Construction Progress Schedule for all work required to complete “Construct Building” work. Payment for the item will be paid via approved submissions showing the percentage of completion for all of the items in the schedule.

672.2.3–Pay Item:

ITEM	DESCRIPTION	UNIT
672002-001	Construct Building, “type”	Lump Sum

“type” shall describe type of work performed

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**DIVISION OF HIGHWAYS****SPECIAL PROVISION****FOR****DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION****I. GENERAL:**

The West Virginia Division of Highways (Division) is committed to assuring the participation of Disadvantaged Business Enterprises (DBEs) in our highway construction program managed by the Civil Rights Compliance (CRC) Division. In support of this commitment and in compliance with the requirements for contracts funded, in whole or part, with assistance from the United States Department of Transportation (USDOT), the Division requires that any contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of USDOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Division deems appropriate.

The contractor shall designate and make known to the Division a liaison officer who is assigned the responsibility of effectively administering and promoting an active program for utilization of Disadvantaged Business Enterprises (DBEs).

If a formal goal has not been designated for this contract, all contractors are encouraged to consider DBEs for subcontract work as well as for the supply of materials and services needed for the performance of this work.

The contractor is encouraged to use the services of banks owned and controlled by minorities or women. Agreements between a bidder/proposer and the DBE in which the DBE promises not to provide subcontracting quotations to other bidders/proposers are prohibited.

II. DEFINITIONS:

- A. “Disadvantaged business enterprise”** means a firm that is certified as a DBE, in accordance with the provisions of 49 CFR §26, by the West Virginia Department of Transportation’s DBE Unified Certification Program.
- B. “USDOT-assisted contract”** means any contract between the Division and a contractor (at any tier) funded in whole or part with USDOT financial assistance, including letters of credit or loan guarantees, except a contract solely for the purchase of land.
- C. “Good faith efforts”** means efforts to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement.
- D. “Joint venture”** means an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their

property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

- E. **“Primary industry classification”** means the North American Industrial Classification System (NAICS) designation which best describes the primary business of a firm. The NAICS is described in the *North American Industry Classification Manual—United States*, which is available via the internet at the U.S. Census Bureau Web site: <http://www.census.gov/eos/www/naics/>.

III. DBE CERTIFICATION REQUIREMENTS:

- A. In order to be classified as a DBE under this specification, a firm must be approved by the DBE Unified Certification Program prior to the letting date of any project in which a firm wants to participate as DBE.
- B. Under 49 CFR Part 26.71(n), DBE firms are not certified in general terms, in a way that makes every type of work performed eligible for DBE credit. Rather, the WVDOT, through its Unified Certification Program, will grant certification to a firm only for specific types of work which the socially and economically disadvantaged owners have the ability to control.
- C. The DBE rule requires all certification actions, including those expanding the types of work a firm is authorized to perform for DBE credit, to be made final before the date on which bidders on a prime contract must respond to a solicitation [49 CFR 26.81(c)].
- D. The DBE Uniform Certification Application and related documents, as well as the directories of certified DBE consulting and contracting firms, may also be obtained from the Division online at: <http://www.transportation.wv.gov/eeo/DBE/Pages/default.aspx>

IV. DBE GOAL:

- A. The DBE goal determined by the West Virginia Division of Highways for this contract is _____% of the contract bid amount.
- B. The contractor shall indicate its goal in the appropriate space in Section C, Item 3 – Contractor’s Goal for DBE Participation, of the Notice contained in the project proposal. The goal so indicated will be used in determining the award of the contract in accordance with this Special Provision and Section 103 of the Standard Specifications.

V. CONTRACTOR’S DBE PLAN:

- A. **Plan requirements.** All bidders are encouraged to submit their DBE Participation Plan (Section C – Contractor’s Plan for DBE Participation) with their bid; or no later than 5 calendar days after bid opening. A Participation Plan form is attached to this provision. The Plan shall include the following:
 1. Name of DBE Subcontractor(s) or Suppliers(s).
 2. Description of work each is to perform, to include: Line Number, Item Number, Description, Type of Work, Quantity, Unit, Unit Cost and Total Cost.
 3. The dollar value of each proposed DBE subcontract and the percentage of the total contract value represented by combined DBE participation; the extent to which payments to DBEs may be counted as DBE participation is set forth in Section VIII., DBE Participation Requirements, below.

4. Written and signed documentation of the bidder's commitment to use a DBE subcontractor whose participation is being utilized to meet the DBE contract goal.
5. Written and signed confirmation from the DBE that it is participating in the contract as provided in the prime contractor's commitment.
6. Plans may be submitted by e-mail to DOT.EEO@wv.gov, fax 304-558-4236, or personal delivery and must be received by the WVDOT CRC Division no later than 4:00 p.m. eastern time on the submission due date.

B. Effect of Failure to Submit a Plan. The bidder who does not submit a DBE Participation plan with the bid shall submit it no later than 5 calendar days after the bid opening as a matter of responsibility. Failure to submit all required information within the required time frame shall be just cause for the annulment of award; and the amount of the guaranty deposited with the Proposal may be retained by the Division and deposited in the Division of Highways Fund, not as a penalty, but as liquidated damages. Award may then be made to the next lowest responsible bidder, or the work may be readvertised or otherwise, as the Division may decide.

C. Qualification of DBEs in Plan. In order to be accepted under this program all DBE subcontractors and suppliers of materials or services must be certified for the applicable Type of Work and NAICS code, in accordance with Section III of this provision, at the time of the letting.

If a DBE firm has not been certified for the type of work it is intending to perform on a given contract, then the Division of Highways cannot count the firm's participation on that contract toward meeting DBE contract goals or the agency's overall DBE goal. If a bidder has submitted a bid with DBE participation in response to the DBE goal, and the DBE firm named in the bid documents has not been certified in the type of work that the DBE firm would perform on the contract, then the bid shall not be considered because it does not qualify as a responsible bid.

D. Changes to DBE Participation Plan. The contractor shall utilize the specific DBEs listed on the DBE Participation Plan to perform the work and supply the materials for which each is listed unless the contractor obtains written consent by the CRC Division. Unless written consent is provided, the contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE.

E. Termination of a DBE from DBE Participation Plan. A prime contractor cannot terminate a DBE subcontractor listed on an approved DBE Participation Plan without good cause, documented by the prior written consent of the Division. For the purposes of this paragraph, good cause includes, but is not limited to, the following circumstances:

1. The listed DBE subcontractor fails or refuses to execute a written contract;
2. The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
3. The listed DBE subcontractor fails or refuses to meet the prime contractor's after-bid-award reasonable, non-discriminatory bond requirements;
4. The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;

5. The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215, and 1200 or applicable State law;
 6. The WV Department of Transportation has determined that the listed DBE subcontractor is not a responsible contractor;
 7. The listed DBE subcontractor voluntarily withdraws from the project and provides written notice to the Division of its withdrawal;
 8. The listed DBE is ineligible to receive DBE credit for the type of work required;
 9. A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;
 10. Other documented good cause as determined by the Division.
- F. Termination without Good Cause.** Good cause does not exist if the prime contractor seeks to terminate a DBE upon which it relied to obtain the contract if the reason for the proposed termination is so that the prime contractor can self-perform the work for which the DBE contractor was engaged or so that the prime contractor can substitute another DBE or non-DBE contractor after contract award.
- G. Procedure for Terminating DBE from DBE Participation Plan.** In order to obtain Division approval to terminate and/or substitute a DBE subcontractor, the following steps are required:
1. The prime contractor must give notice in writing to the DBE subcontractor, with a copy to the Division, of its intent to request to terminate and/or substitute; the notice must state the reason for the termination and/or substitution and must give the DBE subcontractor five (5) calendar days to respond to the notice.
 2. The DBE subcontractor must respond to the notice within the five calendar day period and advise the Division and the prime contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Division should not approve the prime contractor's action; if required in a particular case as a matter of public necessity (*e.g.* safety), the Division may provide a response period shorter than five days.
 3. In addition to post-award terminations, the provisions of this bullet (G) *Procedure for Terminating DBE from DBE Participation Plan* apply to pre-award deletions of, or substitutions for, DBE firms put forward by offerors in negotiated procurements.

VI. CONTRACT AWARD REQUIREMENTS:

- A. Good Faith Efforts Required.** In order to be deemed responsible and be awarded this contract, a bidder must demonstrate good faith efforts to meet the DBE goal established by the Division. The bidder can meet this good faith requirement in either of two ways:
1. The bidder can meet the goal, documenting commitments for participation by DBE firms sufficient for this purpose on a Contractor's Plan for DBE Participation (a sample is attached to this Special Provision), or
 2. The bidder can document adequate good faith efforts showing that the bidder took all necessary and reasonable steps to achieve a DBE goal which, by their scope, intensity, and appropriateness to the objective, would be reasonably expected to obtain sufficient DBE participation, even if they were not fully successful.

The following is a list of types of actions that will be considered as part of the bidder's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

- a. Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
- b. Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.
- c. Providing interested DBEs with adequate information about the plans, specifications and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- d. Negotiating in good faith with interested DBEs.
 - i. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.
 - ii. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.
- e. Not rejecting DBEs as unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal.

- f. Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance required by the Division or contractor.
- g. Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- h. Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.

- B. Determining Good Faith Efforts.** In determining whether a bidder has made good faith efforts, the Division may take into account the performance of other bidders in meeting the contract. For example, when the apparent successful bidder fails to meet the contract goal, but others meet it, the Division may reasonably raise the question of whether, with additional reasonable efforts, the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the goal, but meets or exceeds the average DBE participation obtained by other bidders, the Division may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made good faith efforts.
- C. Documentation of Good Faith Effort.** When the established contract goal is not being met, all documentation of good faith effort must be submitted to the CRC Division, and must be received no later than five (5) calendar days after bid opening as a matter of responsibility. Contractors who fail to demonstrate that good faith efforts were made prior to the bid shall not be eligible to be awarded the contract. The Division may take any efforts it deems appropriate to assure the completeness and accuracy of documentation submitted to demonstrate good faith efforts.
- D. Bidder's Assurance.** The bidder's signature in Section J of the Notice contained in this proposal shall be written assurance he/she will comply with this special provision. The Contractor's proposed DBE goal percent (Section C Item 3) must be completed or the bid will be deemed irregular.
- E. Failure to Demonstrate Good Faith Effort.** A bid that fails to demonstrate good faith effort MUST be excluded from consideration as non-responsible. Under 49 CFR 26.53(a), when there is a contract goal the Division "must award the contract only to a bidder who makes a good faith effort to meet it." Federal funds cannot be used to fund contract activities that are not in compliance with 49 CFR Part 26. If the Division determines that the apparent successful bidder has failed to meet the requirements to demonstrate good faith effort, the Division will, before taking any further action, provide the bidder an opportunity for administrative reconsideration of the Division's determination.
1. As part of this reconsideration, the bidder will have the opportunity to provide written documentation or argument concerning the issue of whether it made adequate good faith effort, by either meeting the contract goal or by documenting its actions to do so.
 2. The Division's decision on reconsideration will be made by an official who did not take part in the original determination that the bidder failed to make adequate good faith effort.

3. The bidder will have the opportunity to meet in person with the reconsideration official to discuss the issue of whether it made adequate good faith effort.
4. The Division will send the bidder a written decision on reconsideration, explaining the basis for finding that the bidder did or did not make good faith effort.
5. The result of the reconsideration process is not appealable to the U.S. Department of Transportation.

VII. CONTRACT COMPLIANCE REQUIREMENTS:

Each contractor or subcontractor that fails to carry out the requirements set forth below will be subject to a breach of contract and, after notification to the Federal Highway Administration, the West Virginia Division of Highways may terminate the contract or subcontract or initiate other such remedy as deemed appropriate.

- A. Policy.** It is the policy of the West Virginia Division of Highways to ensure non-discrimination in the award and administration of USDOT-assisted contracts, to create a level playing field on which DBEs can compete fairly for USDOT-assisted contracts, to ensure that the DBE program is narrowly tailored in accordance with applicable law, to ensure that only firms that fully meet eligibility standards are permitted to participate as DBEs, to help remove barriers to the participation of DBEs in USDOT-assisted contracts, and to assist in the development of firms that can compete successfully in the marketplace outside the DBE program. Consequently, the DBE requirements of 49 CFR Part 26 apply to this contract.
- B. DBE Obligation.** By execution of the contract, the contractor expressly accepts and agrees to the following assurance, and further agrees to include this assurance in each and every subcontract executed between the prime contractor and a subcontractor: The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of USDOT-assisted contracts.
- C. Sanctions.** Failure by the prime contractor to fulfill the DBE requirements and to demonstrate good faith efforts constitutes a breach of contract. In the event of a breach of contract, the Division may take the following actions:
 1. Withholding of progress payments.
 2. Withholding payment to the prime contractor in an amount equal to the unmet portion of the contract goal.
 3. Termination of the contract.
 4. Such other remedy as the Division deems appropriate.
- D. Records and Reports.** All contractors must keep detailed records and provide regular reports to the Division on a quarterly basis, or as requested, on their progress in meeting contractual DBE obligations. These records may include, but are not be limited to, payroll, lease agreements, cancelled payroll checks, cancelled supply and material checks, and executed subcontracting agreements. At the end of each quarter, prime contractors will be requested to submit certified reports on monies paid to each DBE subcontractor/supplier on all active USDOT-assisted contracts.

VIII. COUNTING DBE PARTICIPATION TOWARD GOAL REQUIREMENTS:

The Division will only count expenditures to a DBE contractor toward DBE goals if the DBE is performing a commercially useful function on the contract. A commercially useful function is generally being performed when a DBE is responsible for the execution of a distinct element of the work and is carrying out its responsibilities by actually performing, managing and supervising the work involved in accordance with normal industry practice (except where such practices are inconsistent with the DBE regulations and these guidelines) and when the DBE firm receives due compensation as agreed upon for the work performed. Regardless of whether an arrangement between the contractor and the DBE represent standard industry practice, if the arrangement erodes the ownership, control or independence of the DBE or does not meet the commercially useful function requirement, sanctions against the DBE firm and the prime contractor may be pursued.

A. DBE Management: The DBE must be responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The DBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering materials, and installing (where applicable) and paying for the material itself. The DBE must perform the work of the contract with its own work force.

If a DBE does not perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own work force, or the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved, the Division will presume that the DBE is not performing a commercially useful function; the DBE may present evidence to rebut this presumption.

When a DBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work may be counted toward DBE goals only if the DBE's subcontractor is itself a DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward DBE goals.

The Division's decisions on commercially useful function are reviewable by the Federal Highway Administration, but are not appealable to the USDOT.

B. Equipment: In order to perform a commercially useful function the DBE subcontractor shall be responsible for any equipment necessary to complete the work within the approved Participation Plan.

1. The DBE may lease equipment consistent with standard industry practices.
 - a. The DBE shall be responsible for negotiating the cost, arranging for the delivery of, and paying for leased equipment.
 - b. Copies of the lease agreements shall be submitted for approval by the Division prior to the work being performed.
 - c. The DBE subcontractor shall provide paid invoices to the Division for all leased equipment.
2. The cost of equipment leased from the prime contractor or its affiliates will not be counted towards the goal. The Division does not consider a DBE subcontractor as performing a commercially useful function when it leases equipment from a prime contractor and the equipment is a critical element of the DBE's ability to perform its contract. All leasing agreements, including incidental equipment leasing agreements between the prime contractor and the DBE subcontractor must be

submitted to and approved by the WVDOT EEO Division prior to performance of the work.

C. Materials: The DBE shall negotiate the cost, determine quality and quantity, arrange delivery of, install (where applicable) and pay for the materials and supplies required for the work of the contract. Invoices for materials should be in the name of the DBE firm not the prime contractor. The Division will count expenditures by DBEs for materials or supplies toward DBE goals as provided in the following;

1. If the materials or supplies are obtained from a DBE manufacturer, count 100 percent of the cost of the materials or supplies toward DBE goals. For the purposes of this paragraph, a manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
2. If the materials or supplies are purchased from a DBE regular dealer, count 60 percent of the cost of the materials or supplies toward DBE goals. A regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers.

3. With respect to materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of materials or supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, toward DBE goals, provided the fees are reasonable and not excessive as compared with fees customarily allowed for similar services. The Division will not count any portion of the cost of the materials and supplies themselves toward DBE goals, however.

The WVDOT may allow the use of joint checks to purchase material/supplies used by the DBE when the following conditions are met: (1) the prime contractor acts solely as a guarantor, (2) the DBE must release the check to the supplier, (3) such payment arrangements are available to all subcontractors and not restricted to DBE's, (4) advance approval is obtained by WVDOT EEO Division.

4. If the materials or supplies are obtained from the prime contractor or an affiliate of the prime contractor, the cost of the materials or supplies will not be counted toward the goal.

D. DBE Trucking Firms: To be certified as a DBE trucking firm, the firm must own at least one fully operational truck that is fully licensed and insured and that is used on a day to day basis. DBE trucking firms must be covered by a subcontract or a written agreement approved by the DOT EEO office prior to performing their portion of the work. In order to perform a commercially useful function, the DBE trucking firm is restricted to the same subcontracting limitation in effect for other contractors. The DBE trucking firm must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a this contract, and there cannot be a contrived arrangement for the purpose of meeting DBE goals.

1. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
2. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
3. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit for the total value of transportation services provided by DBE-owned trucks on the contract. The DBE is entitled to credit for the total value of transportation services provided by non-DBE lessees not to exceed the value of transportation services provided by DBE-owned trucks on the contract.

Example – DBE Firm X uses two of its own trucks on a contract. It leases two trucks from DBE Firm Y and six trucks from non-DBE Firm Z. DBE credit would be awarded for the total value of transportation services provided by Firm X and Firm Y, and may also be awarded the total value of transportation services provided by four of the six trucks provided by Firm Z. In all, full credit would be allowed for the participation of eight trucks. With respect to the other two trucks provided by Firm Z, DBE credit could be awarded only for the fees or commissions pertaining to those trucks Firm X receives as a result of the lease with firm Z.

4. A lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

G. Suspensions and Decertification's: If any DBE listed on the *Contractor's DBE Plan* has been suspended or decertified as a DBE **before** the execution of a subcontract agreement between the Prime and the DBE, the DBE's proposed work cannot be counted toward the project's DBE goal. Conversely, if a DBE has been suspended or decertified **after** the Prime and the DBE have executed a subcontract agreement, the contractor may continue to use the DBE and will continue to receive credit toward the project's DBE goal.

H. North American Industrial Classification (NAIC):

DBE work can only be counted toward meeting the contract DBE goal if the work to be performed by the DBE is:

1. Within the Type of Work for which the DBE is certified AND
2. Within the classification of the North American Industry Classification System (6 digit NAIC codes) approved for the DBE.

PARTICIPATION OF A DBE SUBCONTRACTOR WILL NOT BE COUNTED TOWARD A CONTRACTOR'S FINAL COMPLIANCE WITH ITS DBE OBLIGATIONS ON A CONTRACT UNTIL THE AMOUNT BEING COUNTED HAS ACTUALLY BEEN PAID TO THE DBE.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION
CONTRACTOR'S PLAN FOR DBE PARTICIPATION

[1] DBE Sub-Contractor or Supplier	[2] Line Number	[3] Item Number	[4] Description	[5] Type of Work (from DBE Directory)	[6] Quantity	[7] Unit	[8] Unit Cost	[9] Total Cost

[10] CONTRACTOR'S DBE GOAL: TOTAL COST OF ALL DBE PARTICIPATION \$ _____. PERCENT OF TOTAL BID AMOUNT: _____

EXPLANATORY NOTES:

- "DBE Sub-Contractor" (column [1]), for the purpose of this certificate, means a disadvantaged business as defined by Special Provisions in this Proposal.
- If material is to be supplied, the figure in column [9] shall not exceed 60% of the actual cost unless the material is manufactured by a DBE; if material IS manufactured by a DBE, 100% of the cost may be recorded.
- If material is not supplied by a regular dealer as defined in 49 C.F.R. 26.55€(2)(ii), the figure in column [9] shall only include a reasonable and customary fee or commission for providing a bona fide service.
- For line [10], enter the total cost of DBE participation and the percentage of the total contract bid amount that this total DBE cost represents.
- The Contractor's authorized signature on this plan shall serve as documentation of commitment to use the DBE subcontractor(s) listed above by the contractor to meet the contract goal.
- The Contractor shall submit written and signed confirmation from the DBE that it is participating in the contract **as provided in the prime contractor's commitment.**

Authorized Signature _____

Title _____

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 101

DEFINITION OF TERMS

101.2-DEFINITIONS:

Completion. Contractor completes all specified work satisfactorily and executes and delivers all required documents, certificates, and proofs of compliance.

Substantial Completion or Substantially Complete-The work on the Contract will be considered substantially complete when ~~the Project could be opened continuously for the safe, convenient, and unimpeded use of the traveling public, or the Project has met the intention of the plans~~ all Items of Work are complete, as ~~reasonably~~ determined by the Engineer; with the exception of permanent roadway striping.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 105
CONTROL OF WORK

105.16-ACCEPTANCE:

105.16.2-Final Acceptance: ~~Upon due notice from the Contractor of presumptive completion of the entire project, Once the Contractor completes all specified work satisfactorily and executes and delivers all required documents, certificates, and proofs of compliance, the Contractor shall provide written notice of completion to the Engineer. If the Engineer will make an inspection agrees the Project is substantially complete will notify the Contractor and will conduct a final inspection within 30 calendar days.~~

~~If the Engineer determines that all construction and other contractual requirements provided for and contemplated by the Contract is found completed to satisfaction are satisfactorily completed, that inspection will constitute the final inspection. The Engineer will make the final acceptance and notify the Contractor in writing of this acceptance. Final acceptance will be the date the Contract Completion Report is fully executed by the Division.~~

~~If, however, the inspection discloses the Engineer determines any work, in whole in part, as being is unsatisfactory, the Engineer will give the Contractor the necessary instruction a punch list for correction of same in writing, within 15 calendar days after inspection. and theThe Contractor shall immediately comply with and execute such instructions. The Contractor shall supply to the Engineer all material certifications, all documents necessary for project finalization, and agree to final quantities within 90 calendar days of punch list notice. If the Contractor fails to give notice of disagreement to the Engineer about any issue within 90 calendar days of punch list notice, including the reason for dispute and justification, the final payment will be based on the Engineer's list of final quantities. If the Contractor fails to provide material certification, the Division may deduct cost of material from the project. The Contractor shall complete all remaining punch list work within 135 calendar days of punch list notice. If the Engineer determines that the punch list is incomplete, the Division may withhold all payments on any and all Contracts. Upon timely correction of the work, another inspection will be made which will constitute the final inspection provided the Engineer determines that the work has been satisfactorily completed.~~

~~In such event, theThe Engineer will make the final acceptance and notify the Contractor in writing of this acceptance. Final acceptance will be the date the Contract Completion Report is fully executed by the Division.~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 108
PROSECUTION AND PROGRESS**

108.6-DETERMINATION AND EXTENSION OF CONTRACT:

108.6.1-General:

DELETE THE CONTENTS OF THE FIFTH PARAGRAPH AND REPLACE THE FOLLOWING:

The work on the Contract will be considered substantially complete when ~~the Project could be opened continuously for the safe, convenient, and unimpeded use of the traveling public, or the Project has met the intention of the plans~~ all Items of Work are complete, as reasonably determined by the Engineer; with the exception of permanent roadway striping. When the Project is considered substantially complete, the Contract time charges shall be discontinued prior to final acceptance being made by the Engineer as prescribed in 105.16.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 109

MEASUREMENT AND PAYMENT

109.8-ACCEPTANCE AND FINAL PAYMENT:

When the project has been accepted, as provided in 105.16, the Engineer will prepare the final estimate of the quantities of the various classes of work performed. Before the final payment is made, the Contractor shall execute the Statement of Acceptance on the back of the final estimate.

After the Contractor executes such final estimate or if the Contractor fails or declines to execute the final estimate within 30 calendar days after receipt, the Division will consider the estimate approved and accepted and ~~he Contractor~~ will be paid the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the provisions of the Contract.

If the Contractor disputes the final estimate, written notice must be provided to the Engineer within 30 calendar days after receipt, indicating the reason for disagreement and all documents, calculations, data or information supporting Contractor's position. Failure to provide timely notice and supporting information to the Engineer will constitute a waiver of Contractor's right to dispute the final estimate. Upon written request from the Contractor received within 30 days of his receipt of the final estimate, the time for review and execution of the final estimate ~~will be extended up to 60 additional calendar days~~ may be modified by mutual agreement of the Contractor and Engineer.

Should the Contractor desire to reserve the right to file a claim with the State Court of Claims for any sum or compensation not included in the final estimate, growing out of the Contract, then a Reservation of Right stipulating the nature, each item and the amount claimed shall be added at the end of the acceptance statement. This claim must be filed with the State Court of Claims within ~~120-60 calendar~~ days of execution of the final estimate. If any monies owed the Division are not paid within ~~120-60 calendar~~ days of the execution of the final estimate, the Division shall have the right to revoke the Contractor's Prequalification until the monies are paid.

All prior partial estimates and payments will be subject to correction in the final estimate and payment.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 109
MEASUREMENT AND PAYMENT**

109.1-MEASUREMENT OF QUANTITIES:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

All work completed under the Contract will be measured by the Engineer according to United States standard measure.

The method of measurement and computations to be used in determining of quantities of materials furnished and of work performed under the Contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise indicated, the requirements prescribed shall govern.

Earthwork will be computed by the average end area method, using the horizontal length measured along the centerline as the distance between sections, applying corrections for curvature where the apparent error exceeds 25 percent of the volume in any one cut. Other acceptable methods may be used.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally and no deductions will be made for individual fixtures having an area of nine square feet (one square meter) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the Plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the Plans or as altered to fit field conditions.

All items which are measured by the linear foot (meter), such as pipe culverts, guardrail, underdrains, etc., will be measured parallel to the base or foundations upon which such structures are placed.

The term "gage" when used in connection with the measurements of plates, will mean the U.S. Standard Gage.

The galvanized sheet thicknesses to be used in the manufacture of metal cribbing, corrugated steel culvert pipe, underdrain pipe, plate pipe, pipe arches, plate pipe arches and plate arches shall be as specified in AASHTO M 36 or AASHTO M 167. The sheet thicknesses to be used in the manufacture of corrugated aluminum alloy culvert pipe, underdrain pipe, plate pipe, pipe arches, plate pipe arches and plate arches shall be as specified in AASHTO M 196 or AASHTO M 219.

The "size number" used in the measurement of wire will be as specified in AASHTO M 32 or AASHTO M 225.

The term ton will mean the short ton consisting of 2,000 lb. (The term megagram is defined as a mass of 1,000 kg). All materials which are measured or proportioned by weight shall be weighed on approved scales by competent, qualified personnel. Scales for weighing shall be of either the beam type, springless-dial type or digital recorder type. All plant and truck scales and metering devices shall be inspected, approved and sealed in accordance with the requirements of the West Virginia Division of Labor, Bureau of Weights and Measures, or other appropriate agencies of the State or its political subdivisions. Poises shall be designed to be locked in any position to prevent unauthorized changes. When the beam type scales are used, provisions for a "telltale" dial shall be made for indicating to the operator that the required load in the weighing hopper is being approached. A device on the weighing beams shall clearly indicate the critical position.

Truck scales shall be provided by the producer or Contractor, except that truck scales are not required where the material is weighed at properly calibrated automatic batching plant facilities which are equipped with digital print-out equipment or electronic ticket delivery (e-ticket) capabilities. The scales shall be of sufficient size and capacity to weigh the heaviest loaded trucks that are used for delivery of the material. All truck scales shall be mounted on solid foundations which will ensure their remaining plumb and level.

A weigh person shall be provided by the producer. The weigh person shall certify that the weight of the material, as determined either by the truck scales or from the digital print-out of the weights, is correct. To signify the certification of weight the weigh person must either sign their full name on each ticket, or if the ticket printer prints the weigh person's full name they must at least initial each ticket. In instance where an e-ticket is provided as documentation on the project; a digital signature of the weigh person on the e-ticket will be considered equivalent as hand-signed/initialed, printed ticket.

Each truck shall be weighed empty prior to each load, except at automatic batch plants approved to operate without truck scales. A digital recorder shall be required on all truck scales. The digital recorder shall produce a ~~printed~~ record of the gross, tare and net weights, and the time, date, truck identification and project number. Provision shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the ~~printing-recording~~ process. The system shall be interlocked so as to allow printing-recording of results only when the scale has come to rest.

In case of a breakdown of the automatic equipment, the Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

If material is shipped by rail, the car weight may be accepted provided the actual weight of material only will be paid for. However, car weights will not be acceptable for material to be passed through mixing plants.

Devices, used to meter or measure component or other materials in a simultaneous manner, shall be located so as to be readily accessible and visible to a single Inspector, unless otherwise directed by the Engineer.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents

may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

When approved by the Engineer, material specified to be measured by the cubic yard (meter) may be weighed and these weights converted to cubic yard (meter) for payment purposes. Further, when it is impractical to measure the material by weighing, or in its original position, the material will be measured in its final position and adjusted by a volume change factor. These conversion factors will be determined by the Engineer and shall be agreed to by the Contractor before these methods of measurement are used.

When bituminous-asphalt material is measured by volume, the measured volume at loading temperature shall be converted to volume at 60° F (15° C) using the temperature correction factors in 705 for asphaltic materials and 706 for tar materials, except that when volume is measured by an approved temperature compensated metering device, no further volume correction for temperature shall be required. When bituminous-asphalt material is measured by weight, the actual specific gravity, API gravity, or weight per gallon (liter) of the material shall be used to convert the measured weight to volume at 60° F (15° C). The Contractor shall furnish all information necessary as determined solely by the Division to determine the amount of bituminous-asphalt material actually incorporated into the project.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous-asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous-asphalt materials are shipped by truck or transport, net certified weights or volume, subject to correction for loss or foaming may be used for computing quantities.

Cement will be measured by the cement in hundredweight (cwt) (hundredweight = 100 lb.) (kilogram). For the purpose of determining the total amount used in the mixture, one bag of cement shall be considered as weighing 0.94 cwt (42.64 kg), and one barrel of cement shall be considered as weighing 3.76 cwt (175.55 kg).

Timber will be measured by the thousand feet board measure (mfbm) (cubic meters) actually incorporated in the structure, unless otherwise noted on the plans. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term "lump sum" when used as an item of payment will mean complete payment for the work described in the Contract.

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

109.20-LOAD LIMIT VIOLATIONS AND WEIGH TICKETS:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The Allowable Gross Weight for any vehicle being used to haul materials on publicly maintained highways under the terms of this contract shall be as follows.

Title 23 Code of Federal Regulations, Section 658.17, establishes maximum allowable gross weight on the Interstate System. The maximum allowable gross weight on WV and US Routes will be as established in Chapter 17C, Articles 17 and 17A of the Official Code of West Virginia, as amended. The Public Service Commission, Weight Enforcement Section is responsible for the enforcement of these provisions.

A weigh ticket shall be required with each load of material from a commercial source which would normally have truck scales. This includes, but is not limited to, all asphalt paving materials and all aggregates regardless of the contract pay unit. The weigh ticket shall include gross, tare, and net weights, time and date of loading, Item Number or Description of Materials, Contract Number or Project Number, number of axles on haul unit, license number of haul unit, and signature of the weigher certifying that all information on the ticket is correct. If the weigher's name is printed by the computer on the ticket, then it only needs to be initialed by the weigher.

The Department will accept electronic ticket delivery (e-ticket) as documentation on projects provided that the standard information currently provided on the paper ticket is included on the e-ticket. The e-ticketing system must provide WVDOH field personnel the ability to access tickets from a smartphone, tablet, or laptop and to make notes associated with each ticket if needed. The service must also provide a daily summary report. A digital signature of the weigh person on an e-ticket or daily summary report shall be considered the equivalent as a hand-signed/initialed, printed ticket.

For material from a commercial source or a batch plant, which would not normally have truck scales, a weigh ticket documenting the tare weight, number of axles on the haul unit, license number of haul unit, date weighed, location of scales, and signature of the weigher certifying that all information on the ticket is correct, may be supplied for each haul unit as an alternate to the ticket required in the previous paragraph. The tare weight ticket shall be supplied for each contract on a yearly basis and when modifications are made to the vehicle or combination of vehicles. The weight of the material delivered shall be calculated and furnished by the vendor/supplier shipping the material to the project site or DOH facility. This includes, but is not limited to, concrete, structural steel, piling, reinforcing steel and all prepackaged material of known weight, such as cement, grout, fertilizer, lime, abrasives, etc.

If the haul unit is a combination of vehicles, the license number shall be supplied for each component. The tare weight shall be for the complete haul unit.

All weighing shall be done on scales approved and sealed by the West Virginia Division of Labor, Bureau of Weights and Measures. If the scales are moved or upon the request of the Engineer, the scales shall be reapproved and sealed. The Engineer shall be notified of any scale malfunctions. The Division of Highways may, at its option, accept inspection and sealing by out of state agencies when the material is being loaded outside West Virginia.

Any material, covered by this provision, which is delivered without the proper weigh ticket shall not be accepted by the Division of Highways.

Nothing in this provision relieves any party from compliance with the State Law on load limits or any fines which may be assessed for violation of said law.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107.21-PROTECTION OF RIVERS, STREAMS, AND IMPOUNDMENTS:

107.21.1-Erosion and Sedimentation Control:

DELETE THE THIRD PARAGRAPH OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Any details not shown in the plans shall be in accordance with the latest version of the ~~West Virginia Division of Highways Erosion and Sediment Control Manual~~ West Virginia Department of Environmental Protection, Erosion and Sediment Control Best Management Practices Manual. In the event that temporary erosion and sediment control measures are necessary due to the Contractors negligence, carelessness or failure to install permanent controls as part of the work as scheduled, such work shall be performed by the Contractor at his own expense.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 207

EXCAVATION AND EMBANKMENT

207.6-DISPOSAL OF MATERIAL:

207.6.3-Waste:

207.6.3.1-Waste Within WVDOH Right-Of-Way Limits:

DELETE THE FORTH PARAGRAPH OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Upon receipt of the Contractor's complete waste site submission, the Engineer shall follow the guidelines as set forth in the latest edition of the ~~Erosion and Sediment Control Manual~~ WVDEP Erosion and Sediment Control Best Management Practices Manual for review and acceptance by the Division. The Contractor may be required to revise the site plan prior to acceptance by the Division. The Contractor's waste site plan must be approved as per section 105.2.1.2 and the West Virginia Department of Environmental Protection before any waste material can be placed in the site.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 211
BORROW EXCAVATION**

211.3-GENERAL:

211.3.1-Borrow within WVDOH R/W Limits:

DELETE THE THIRD PARAGRAPH OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Upon receipt of the Contractor's complete borrow site submission, the Engineer shall follow the guidelines as set forth in the latest edition of the ~~Erosion and Sediment Control Manual~~ WVDEP Erosion and Sediment Control Best Management Practices Manual for review and acceptance by the Division. The Contractor may be required to revise the site plan prior to acceptance by the Division. The Contractor's borrow site plan must be approved as per section 105.2.1.2 and the West Virginia Department of Environmental Protection before any borrow material can be obtained from the site.

211.3.3-Impervious Core:

DELETE THE SECOND PARAGRAPH OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The impervious core shall have a minimum dimensions as set forth in ~~Item 5, par. 20.3.4.3.1 Erosion and Sediment Control Manual, West Virginia Division of Highways~~ WVDEP Erosion and Sediment Control Best Management Practices Manual, latest edition.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 212
STRUCTURE, ROCK, AND WET EXCAVATION**

ADD THE FOLLOWING SUBSECTIONS TO THE SECTION:

212.1-DESCRIPTION:

212.1.1-Shoring: This work consists of providing shoring to contain causeway material at specific areas designated in the Contract and any temporary bridge structures needed to maintain flow of water around causeway structures.

212.3-GENERAL:

212.3.1-Shoring: Materials and Construction Requirements: The Contractor shall locate, size, design and construct shoring which provides all necessary rigidity, and supports the loads imposed to facilitate construction as shown on the plans. The areas shown on plan are representative of what may be constructed under the U.S. Army Corps of Engineers 404 Permit. The contractor may reduce the causeway areas or use other means of Construction Access provided these means do not violate the 404 Permit requirements.

When the height of shoring exceeds 5' above the base of the excavation, shoring drawings shall be provided by the Contractor to the Engineer for information only. The drawings shall be prepared, signed and sealed by the Contractor's Engineer. These drawings shall be approved and signed by the Contractor and provided to the Engineer at least 10 days prior to start of work.

Temporary bridge drawings shall be provided by the Contractor to the Engineer for information only. The drawings shall be prepared, signed and sealed by the Contractor's Engineer. These drawings shall be approved and signed by the Contractor and provided to the Engineer at least 10 days prior to start of work. October 19, 2012

Shoring and temporary bridges shall be constructed in conformity with the shoring and bridge drawings provided to the Engineer. Prior to placing construction or traffic loads on the supported earth and bridges, the Contractor's Engineer shall certify in writing that shoring and

bridge materials and construction have been inspected and that all shoring, bridge, materials and construction are in conformity with the drawings. A copy of this certification shall be submitted in an appropriate form for the Engineer's records.

If the embankment, construction, traffic or any other surcharge is in excess of what the original shoring or bridges were designed for, the Contractor shall provide a signed letter from the Contractor's Engineer prior to the load placement stating that the shoring and/or bridges will support the additional load.

Shoring and bridge drawings shall include the following information as applicable:

1. The size and grade of all structural materials.
2. Design notes, including design assumptions and construction details.
3. Where applicable, restrictions on heavy equipment placement at specific locations adjacent to the shoring.
4. Areas determined by the Contractor's Engineer where de-watering of the shored excavation will be required, and a description of the requirements (i.e., head added by the pump, flow rate, minimum pump size, etc.) and methods to be used for de-watering.
5. All other information determined by the Contractor's Engineer to be pertinent to the design and successful construction of the shoring and/or bridges.

212.11-METHOD OF MEASUREMENT:

212.11.1-Shoring: Shoring and temporary bridge structures will not be measured, but will be paid for as a single lump sum for each area described on the plans.

212.12-BASIS OF PAYMENT:

212.12.1-Shoring: Payment for shoring, causeway will be full compensation for all labor, materials equipment required to design, construct and remove the shoring and temporary bridges.

212.13-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
212010-001	Shoring, Causeway	Lump Sum

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 212
STRUCTURE, ROCK, AND WET EXCAVATION**

ADD THE FOLLOWING SUBSECTIONS TO THE SECTION:

212.1-DESCRIPTION:

212.1.1-Shoring: This work consists of providing shoring to contain causeway material at specific areas designated in the Contract and any temporary bridge structures needed to maintain flow of water around causeway structures.

212.3-GENERAL:

212.3.1-Shoring: Materials and Construction Requirements: The Contractor shall locate, size, design and construct shoring which provides all necessary rigidity, and supports the loads imposed to facilitate construction as shown on the plans. The areas shown on plan are representative of what may be constructed under the U.S. Army Corps of Engineers 404 Permit. The contractor may reduce the causeway areas or use other means of Construction Access provided these means do not violate the 404 Permit requirements.

When the height of shoring exceeds 5' above the base of the excavation, shoring drawings shall be provided by the Contractor to the Engineer for information only. The drawings shall be prepared, signed and sealed by the Contractor's Engineer. These drawings shall be approved and signed by the Contractor and provided to the Engineer at least 10 days prior to start of work.

Temporary bridge drawings shall be provided by the Contractor to the Engineer for information only. The drawings shall be prepared, signed and sealed by the Contractor's Engineer. These drawings shall be approved and signed by the Contractor and provided to the Engineer at least 10 days prior to start of work. October 19, 2012

Shoring and temporary bridges shall be constructed in conformity with the shoring and bridge drawings provided to the Engineer. Prior to placing construction or traffic loads on the supported earth and bridges, the Contractor's Engineer shall certify in writing that shoring and

bridge materials and construction have been inspected and that all shoring, bridge, materials and construction are in conformity with the drawings. A copy of this certification shall be submitted in an appropriate form for the Engineer's records.

If the embankment, construction, traffic or any other surcharge is in excess of what the original shoring or bridges were designed for, the Contractor shall provide a signed letter from the Contractor's Engineer prior to the load placement stating that the shoring and/or bridges will support the additional load.

Shoring and bridge drawings shall include the following information as applicable:

1. The size and grade of all structural materials.
2. Design notes, including design assumptions and construction details.
3. Where applicable, restrictions on heavy equipment placement at specific locations adjacent to the shoring.
4. Areas determined by the Contractor's Engineer where de-watering of the shored excavation will be required, and a description of the requirements (i.e., head added by the pump, flow rate, minimum pump size, etc.) and methods to be used for de-watering.
5. All other information determined by the Contractor's Engineer to be pertinent to the design and successful construction of the shoring and/or bridges.

212.11-METHOD OF MEASUREMENT:

212.11.1-Shoring: Shoring and temporary bridge structures will not be measured, but will be paid for as a single lump sum for each area described on the plans.

212.12-BASIS OF PAYMENT:

212.12.1-Shoring: Payment for shoring, causeway will be full compensation for all labor, materials equipment required to design, construct and remove the shoring and temporary bridges.

212.13-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
212010-001	Shoring, Causeway	Lump Sum

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 403
CRACK SEALING IN ASPHALT PAVEMENT**

403.1–DESCRIPTION:

The work shall consist of the cleaning, crack sealing, and crack filling in asphalt pavement in the manner and subject to the conditions and regulations prescribed.

403.2–MATERIALS:

The material shall be hot poured crack sealant and conform to the requirements of Section 708.3 of the Specifications. As well as being compatible with asphalt pavement recycling.

403.3 WEATHER RESTRICTIONS:

The sealant material shall not be applied when the weather is foggy, rainy or when the ambient and pavement temperatures are below 40° F.

403.4–CONSTRUCTION:

403.4.1–Preparation of Material for Use: Before charging the compound into the melting unit, the unit shall be free from all foreign material. If the type of heater to be used requires that the sealing material, as shipped, be cut into smaller pieces before melting, the cutting method used is subject to the approval by the Engineer.

The heating kettle used for melting sealing materials shall be of the indirect heating or double boiler type, using oil as the heat transfer medium. It shall have a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath. Other methods of indirect heating approved by the Engineer may be used. A positive means of controlling the temperature of the heat transfer at all points in the system shall be incorporated in the heater. Sealing material shall be uniformly heated until the pouring temperature recommended by the manufacturer is reached. Should the maximum pouring temperature recommended be exceeded, the material will be rejected. The material shall be poured as soon as possible after

the pouring temperature is reached. Only sufficient material for the day's operation shall be heated each day.

403.4.2-Preparation of Joints and Cracks for Sealing: The cracks shall be thoroughly cleaned of all loose scale, dirt, dust, vegetation, or other foreign matter prior to placing hot poured crack sealant. This may be accomplished by use of compressed air, hand tools, power tools such as rotary brushes, or by any method or combination of methods. The use of any tool which results in damage to the pavement is prohibited. Oil/water separator shall be used on all air compressor equipment when cleaning the crack.

403.4.3-Equipment for Applying Sealer: The equipment used shall conform to the manufacturers recommendations and consist of heating units from which material may be discharged into the crack through the use of flexible lines and suitable shoes.

403.4.4-Placement Requirements: Any spillage of sealing material on pavements shall be immediately removed. A neat and workmanlike job will be required at all times. At no time shall sealing material be placed in a crack which either dirty or wet. The crack shall be clean and surface dry at the time of placement. Work will be suspended when cracks are wet or damp and when the atmospheric temperature is below the minimum specified by the manufacturer. The standard overband shall be 3" centered over the crack. After the sealant has cooled, settling shall not exceed 3/8" below the surface. Any damage to uncured sealant shall be repaired at the contractor's expense.

403.4.5-Equipment, Personnel, and Documentation Requirements: The Contractor (two (2) days prior to commencement of the project) shall submit to the Engineer a detailed list of all equipment to be used for crack sealing on the project. The Contractor shall also provide certification from the Sealing material manufacturer that the Contractor is qualified to apply the manufacturer's material in conformance with these specifications and the manufacture's recommendations.

The Contractor is responsible for quality control, and shall submit a quality control plan in accordance with these specifications to the Engineer at the Pre-Construction Conference.

403.5 – METHOD OF MEASUREMENT:

The quantity of work done will be measured in linear feet of "Crack Sealing in Asphalt Pavement". Measurement is to be conducted after cleaning and prior to the placement of the sealant.

403.6 – BASIS OF PAYMENT:

The quantity of work, as determined above, will be paid for at the contract unit price bid for the item below, which price and payment shall be full compensation for furnishing all materials, and doing all the work prescribed in a workmanlike and acceptable manner, including all the labor, tools, equipment, supplies and incidental necessary to complete the work.

403.7-PAY ITEM:

ITEM	DESCRIPTION	UNIT
403001-001	Crack Sealing in Asphalt Pavement	Linear Foot

July 28, 2020

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
SUPPLEMENTAL SPECIFICATION
FOR
SECTION 504
BITUMINOUS UNDERSEAL FOR CONCRETE PAVEMENT

DELETE THE ENTIRE SECTION

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**DIVISION OF HIGHWAYS****SPECIAL PROVISION****FOR****STATE PROJECT NUMBER:** _____**FEDERAL PROJECT NUMBER:** _____**SECTION 504****~~BITUMINOUS~~ ASPHALT UNDERSEAL FOR CONCRETE PAVEMENT****504.1-DESCRIPTION:**

This work shall consist of drilling holes in Portland cement concrete pavement at the locations shown on the Plans or where directed by the Engineer, pumping ~~bituminous~~ asphalt material through the holes, and sealing the holes with cement grout.

504.2-MATERIALS:

The materials shall meet the requirements specified in the following Subsections of Division 700:

MATERIAL	SUBSECTION
Asphalt Cement	705.6
Fine Aggregate*	702.1
Portland Cement	701.1 & 701.3
Water	715.7

* The use of limestone sand will not be permitted.

Grout for sealing holes shall consist of one part Portland cement and three parts fine aggregate, mixed to the consistency directed by the Engineer.

CONSTRUCTION METHODS**504.3-GENERAL:**

Holes of 1-1/2 in. (40 mm) diameter shall be drilled through the concrete pavement at the locations shown on the Plans or as directed by the Engineer. ~~Bituminous~~ Asphalt material shall then be pumped through the holes and under the pavement by means of an approved type of pump.

Equipment for pumping shall be capable of developing a pressure of 80 lb. per sq. in. (550 kPa), the exact working pressure to be determined by the Engineer.

Prior to pumping, the surface of the concrete pavement around the previously drilled holes shall be thoroughly sprinkled with water or shall be covered with sand, earth or other suitable material in order to prevent any bitumen that may be spilled on the pavement from adhering to the surface. The nozzle shall then be inserted in the hole, driven to a snug fit, and pumping operations begun. ~~Bituminous Asphalt~~ material shall be pumped through the holes and under the pavement until the voids under the pavement are completely filled, or the concrete pavement has been raised to the grade of existing adjacent pavement or to such grade as directed by the Engineer. At the first indication of an undesirable movement of the slab or a blowout, pumping shall immediately be discontinued. The connecting device placed in the drilled hole shall not be removed from the hole until the bitumen has cooled sufficiently to prevent backflow. At the time the ~~bituminous asphalt~~ material is pumped under the pavement, it shall have a temperature of not less than 400° F (205° C). The Contractor shall provide all necessary facilities for determining the temperature of the ~~bituminous asphalt~~ material in all heating equipment and distributors.

After completion of the pumping in each hole, all ~~bituminous asphalt~~ material shall be cleaned from the pavement surface and the drilled hole shall be filled with grout to an elevation flush with the pavement surface.

After the completion of subsealing operations, the pavement surface shall be left in a clean and neat condition satisfactory to the Engineer.

The ~~bituminous asphalt~~ material shall not be applied on a frozen subgrade, nor when the atmospheric temperature is below 40° F (5° C) and is falling, with the further provision that it shall be placed only when general weather conditions, in the opinion of the Engineer, are suitable.

504.4-METHOD OF MEASUREMENT:

The quantity of work done will be measured in gallons (liters) of "~~Bituminous Asphalt~~ Underseal Material" and in "Drilling Holes in Concrete Pavement" determined as follows: The quantity of "~~Bituminous Asphalt~~ Underseal Material" shall be the number of gallons (liters) incorporated in the completed and accepted work, which volume will be measured as prescribed in 109.1. The quantity of "Drilling Holes in Concrete Pavement" shall be the actual counted number of holes drilled and satisfactorily filled.

504.5-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all the materials, including grout, and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies and incidentals necessary to complete the work.

504.6-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
504001-*	Bituminous Asphalt Underseal Material	Gallon (Liter)
504002-*	Drilling Holes In Concrete Pavement	Each

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 601
STRUCTURAL CONCRETE**

601.3-PROPORTIONING:

601.3.2-Field Tolerances and Adjustments:

601.3.2.3-Yield:

ADD THE FOLLOWING SENTENCE TO THE END OF THE THIRD PARAGRAPH

The Division shall perform Yield tests randomly throughout the progress of work to verify the accuracy of the Contractor's tests.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 603

PRESTRESSED CONCRETE MEMBERS

603.2-MATERIALS:

603.2.1-Inspection and Testing:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

A representative of the Engineer shall have free entry at all times, while the work on the Contract is being performed, to all parts of the manufacturer's works which concern the manufacture of the materials ordered. The manufacturer shall afford the representative of the Engineer, without charge, all reasonable facilities to satisfy themselves that the material is being furnished in accordance with these specifications. Inspection and acceptance procedures for prestressed concrete bridge members shall be in accordance with MP 603.10.40.

The Fabricator's QC Personnel, as a minimum, shall be a certified ACI Grade I Concrete Field Testing Technician and/or a WVDOH PCC Inspector. In addition, if Self-Consolidating Concrete (SCC) is used, Fabrication Plant QC Personnel shall be a certified ACI SCC Testing Technician.

603.6-CONCRETE:

603.6.2-Mix Design:

603.6.2.1-Class S-P Concrete Mix Design Testing:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

To ensure repeatability of production, two batches of concrete with the same mix proportions shall be created for mix qualification testing. The results of this testing shall be submitted to the Division for approval at least 45 days prior to the use of the mix in construction. Personnel performing testing on Class S-P concrete shall be certified by ACI as a Self-Consolidating Concrete Testing Technician.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**DIVISION OF HIGHWAYS****SUPPLEMENTAL SPECIFICATION****FOR****SECTION 606
UNDERDRAINS****606.2-MATERIALS:**

ADD THE FOLLOWING TO THE TABLE:

MATERIAL	SUBSECTION	TYPE OR GRADATION
<u>Outlet Pipe</u>	<u>715.10.1.5</u>	

606.2.3-Free Draining Base Trench Materials:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The perforated pipe and outlet pipe as detailed on the plans shall meet the requirements of this Section. ~~The Outlet pipe as detailed on the plans shall meet the requirements of Subsection 715.10.1.5.~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 615
STEEL STRUCTURES**

615.1-GENERAL:

615.1.1-Description:

ADD THE FOLLOWING:

Jacking Steel Superstructure. This work shall consist of the design and implementation of the jacking of steel superstructure to complete repairs as described in the plans. Jacking of steel superstructure shall include access, jacks, structural members, connections, rollers and other supports as needed to jack the superstructure and adequately support the anticipated loads during construction, including, but not limited to, dead loads, wind loads, and construction loads.

Temporary Falsework. This work shall consist of the design, installation, and removal of temporary falsework to support the bridge while completing repairs as described in the plans. Temporary falsework shall include foundations, structural members, connections, bracing, and other supports as needed to adequately support the anticipated loads during construction, including, but not limited to, dead loads, wind loads, and construction loads.

Shoring, Causeway. This work shall consist of construction of the causeway that is required for the shoring towers if they are placed outside the causeway limits as described in the plans. This work shall also include all necessary work required to maintain and remove the causeway and to restore the area to its original condition and obtaining all permits necessary for constructing the causeway.

615.1.2-Notice of Beginning Work:

ADD THE FOLLOWING:

615.1.2.1-Submittals: Submittals shall be accepted by the Engineer prior to commencement of the subject work.

ADD THE FOLLOWING SUBSECTION:

615.1.5-Alternate Technical Concepts (ATCs): ATCs eligible for consideration shall be limited to those deviations from the requirements of the plans that result in performance and quality of the end product that is equal to or better than the performance and quality of the end product absent the deviation, as determined by WVDOH in its sole discretion. A concept is not an ATC if, in WVDOH's sole judgment, it merely results in reduced quantities, performance or reliability. A concept is not eligible for consideration as an ATC if it is premised upon or would require an increase in the amount of time required for the work to be completed. ATCs that, if implemented, would require further environmental evaluation may be allowed, provided that the Contractor will bear the schedule and cost risk associated with such additional environmental evaluation. If the Contractor is not able to obtain the approvals necessary to implement the ATC, the Contractor will be obligated to complete the work in accordance with existing approvals without additional cost or extension of time.

If a Contractor is unsure whether a concept is consistent with the requirements of the contract or if that concept would be considered an ATC by WVDOH, WVDOH recommends that the Contractor submit such concept for review as an ATC.

615.1.5.1-Design Requirements: The ATC shall conform to the following design conditions and/or requirements:

- (a) temporary towers and works shall have the ability to roll-in and roll-out of the bridge or support the bridge in-place;
- (b) hydraulic analysis of the flood area shall be evaluated with all temporary towers and works in place; a hydrologic and hydraulic report shall be signed and sealed by a West Virginia Registered Professional Engineer;
- (c) geometry of the bridge shall be verified by survey and submitted to the Engineer;
- (d) calculations shall be signed and sealed by a West Virginia Registered Professional Engineer;

615.1.5.2-Bidding: The Contractor is only allowed to bid an ATC if approved to do so in advance of the letting date by the WVDOH. Bids will be rejected if an ATC is bid without approval.

615.1.5.3-Submission: The Contractor may submit ATCs for review to WVDOH Project Manager: (Name) until the date and time identified. All ATCs shall be submitted in writing, with a cover sheet identifying the Contractor and stating "Capon Bridge – Confidential ATCs." The Contractor shall clearly identify the submittal as a request for review of an ATC. If the Contractor does not clearly designate its submittal as an ATC, the

submission will not be treated as an ATC by WVDOT. ATC submittals shall include an electronic copy of a narrative description of the ATC and technical information, including drawings, as described below:

- (a) a sequential ATC number identifying the Contractor and the ATC number (multi-part or multi-option ATCs shall be submitted as separate individual ATCs with unique sequential numbers);
- (b) a description and conceptual drawings of the configuration of the ATC or other appropriate descriptive information;
- (c) the locations where, and an explanation of how, the ATC will be used;
- (d) any changes in operations requirements associated with the ATC, including ease of operations;
- (e) any changes in maintenance requirements associated with the ATC, including ease of maintenance;
- (f) any reduction in the time period necessary to design and perform the construction operations resulting from implementing the ATC, including, as appropriate, a description of method and commitments;
- (g) references to requirements of the contract documents which are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations;
- (h) the analysis justifying use of the ATC and why the deviation, if any, from the requirements of the contract documents should be allowed;
- (i) a preliminary analysis of potential impacts on vehicular traffic (both during and after construction), environmental permitting, community impact, safety, and lifecycle costs, including impacts on the cost of repair, maintenance and operation;
- (j) if and what additional right-of-way will be required to implement the ATC; Contractors are advised that they shall:
 - i. be solely responsible for the acquisition of any such right-of-way, including the cost thereof and obtaining any necessary Environmental Approvals;
 - ii. not be entitled to any additional time or money as a result of Site conditions (i.e., Hazardous Materials, differing site conditions, geotechnical issues, Utilities, etc.) on such additional right-of-way; and
 - iii. not be entitled to any additional time or money as a result of any delay, inability or cost associated with the acquisition of such right of way);
- (k) a description of other projects where the ATC has been used, the degree of success or failure of such usage and names and contact information including phone numbers and e-mail addresses for project owner representatives that can confirm such statements;
- (l) a description of added risks to WVDOT or third parties associated with implementing the ATC;
- (m) an estimate of any additional WVDOT, Contractor and third party costs associated with implementation of the ATC;
- (n) an estimate of any savings that would accrue to WVDOT should the ATC be approved and implemented; and
- (o) a description of how the ATC is equal or better in quality and performance than the requirements of the contract documents;

If implementation of an ATC will require approval by a third party (e.g., a governmental authority), the Contractor will have full responsibility for, and bear the full risk of, obtaining any such approvals. If any required third-party approval is not subsequently granted with the result that the Contractor must comply with the requirements of the contract documents, the Contractor will not be entitled to any additional time or money.

615.1.5.4-Review: WVDOH may request additional information regarding proposed ATCs at any time and will, in each case, return responses to each Contractor regarding its ATC on or **before the date and time identified**, provided that WVDOH has received all requested information regarding such ATC.

WVDOH's responses will be limited to one of the following statements:

- (a) the ATC is acceptable for inclusion in the bid;
- (b) the ATC is not acceptable for inclusion in the bid;
- (c) the ATC is not acceptable in its present form, but may be acceptable upon the satisfaction, in WVDOH's sole discretion, of certain identified conditions which must be met or clarifications or modifications that must be made; or
- (d) the submittal does not qualify as an ATC but may be included in the Contractor's bid without an ATC (i.e., the concept complies with the contract requirements).

WVDOH will make a preliminary determination on whether to accept and approve an ATC for submission. However, the Contractor will be responsible for ensuring that the final submittal complies with the contract requirements.

Approval of an ATC will constitute a change in the specific requirements of the contract documents associated with the approved ATC for that specific Contractor. Each Contractor, by submittal of its bid, acknowledges that the opportunity to submit ATCs was offered to all Contractors, and waives any right to object to WVDOH's determinations regarding acceptability of ATCs.

WVDOH's rejection of a pre-bid submission of an ATC will not entitle the Contractor to an extension of the bid Due Date or the date that the ATCs are due; provided, however, that the foregoing shall not limit WVDOH's absolute and sole right to modify the bid Due Date or any other date in connection with this procurement.

WVDOH anticipates that its comments provided to a Contractor will be sufficient to enable the Contractor to make any necessary changes to its ATCs. However, if a Contractor wishes additional clarifications regarding necessary changes, the Contractor may provide a written request for clarifications.

615.2-WORKING DRAWINGS:

615.2.2-Caber Diagram:

ADD THE FOLLOWING TO SECTION 615.2.2:

The Contractor shall conduct a pre- and post- surveys at each panel point to verify that the geometry has been maintained.

ADD THE FOLLOWING:

615.2.3-Temporary Falsework: The Contractor shall submit drawings illustrating fully their proposed method of temporary support. The drawings shall show details of all falsework bents, bracings, guys, dead-men, and attachments to the bridge; sequence of installation; installation procedures; capacities and weights. The drawings shall be complete in detail for all anticipated phases and conditions during erection. Design calculations, sealed by a West Virginia Registered Professional Engineer, shall be submitted by the Contractor to the Engineer twenty-one days prior to commencing work, unless otherwise noted in the plans. Receipt of plans, drawings and calculations does not constitute review or approval or relieve the Contractor of their responsibility to satisfactorily design the temporary falsework. The design calculations shall demonstrate that member capacities for falsework and supported members are not being exceeded.

615.2.4-Jacking Steel Superstructure: The Contractor shall submit drawings illustrating fully their proposed method of jacking the superstructure. The drawings shall show details of all jacks and product data; structural members, rollers, connections and other supports; sequence of jacking; and jacking procedures. The drawings shall be complete in detail for all anticipated phases and conditions during erection. Design calculations, sealed by a West Virginia Registered Professional Engineer, shall be submitted by the Contractor to the Engineer twenty-one days prior to commencing work, unless otherwise noted in the plans. Receipt of plans, drawings and calculations does not constitute review or approval or relieve the Contractor of their responsibility to satisfactorily design the jacking of the superstructure. The design calculations shall demonstrate that member capacities for jacking and supported members are not being exceeded.

615.2.5-Shoring, Causeway: The Contractor shall submit drawings illustrating fully their proposed method and limits of the causeway for the shoring towers if it beyond the limits as described in the plans. The drawings shall show details of the materials used; sequence of installation; installation procedures. The drawings shall be complete in detail for all anticipated phases and conditions during construction. Design calculations, sealed by a West Virginia Registered Professional Engineer, shall be submitted by the Contractor to the Engineer twenty-one days prior to commencing work, unless otherwise noted in the plans. Receipt of plans, drawings and calculations does not constitute review or approval or relieve the Contractor of their responsibility to satisfactorily design and construct the causeway.

615.6-ERECTION:**ADD THE FOLLOWING:**

615.6.10-Temporary Falsework: The Contractor's attention is directed to sections 615.6.1 and 615.6.8. If the Contractor chooses not to place temporary falsework or the temporary falsework does not successfully support the loads and/or the supported structure is damaged, the Contractor is responsible for all remedies to return the supported structure to the original condition, as directed by the Engineer.

615.8-BASIS OF PAYMENT:

ADD THE FOLLOWING:

615.8.1-Temporary Falsework: The Contractor will be paid 75% of the bid price for this item once all the falsework is in place. The remaining 25% will be paid once it is all removed.

615.8.2-Jacking Steel Superstructure: The Contractor will be paid 50% of the bid price for this item once the truss is moved out. The remaining 50% will be paid once all jacking operations are completed and equipment removed.

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all the material and doing all the work herein prescribed in workmanlike and acceptable manner including all labor, tools, equipment, supplies, access, installation of web-stiffeners (if required), beveled plates, rollers, structural modifications (if required), and incidentals necessary to complete the work.

615.8.3-Shoring, Causeway: The Contractor will be paid 50% of the bid price for this item once the causeway is constructed. The remaining 50% will be paid once the causeway is removed and the area is restored to its original conditions.

615.9-PAY ITEMS:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
202010-001	Shoring, Causeway, per ATC	Lump Sum
615010-003	Temporary Falsework, per ATC	Lump Sum
615039-001	Jacking Steel Superstructure, per ATC	Lump Sum

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR
SECTION 626
RETAINING WALL SYSTEMS

626.7-METHOD OF MEASUREMENT:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

626.7.1-General: The unit of measurements shall be the ~~gross~~-area in square feet (meters) lying in a plane outside the front face of the structure as determined by the ~~dimensions in the contract documents~~ Plan Quantity as provided in the proposal, unless otherwise directed by the Engineer. The ~~gross~~-area is taken from the top of the leveling pad to the top of the wall and shall not include barriers, footings, or leveling pads. The ~~gross~~-area shall be the ~~number of square feet (square meters) measured,~~ subject to adjustment as provided in Sections 104.2 and 109.2 of the ~~Standard~~ Specifications. No adjustments of pay quantity shall be allowed for changes in wall design to facilitate the Contractor's methods of construction of wall type.

Unless otherwise specified in the contract documents, items such as concrete barriers that are not part of normal retaining wall construction shall be measured separately for payment.

The quantity of earthwork shown in the plans does not include any work within the wall pay limits shown in the plans. Any adjustments to the required amount of embankment or select granular backfill due to the particular wall system proposed by the contractor shall be considered incidental to the project. No separate payment shall be made for increased embankment or increased select granular backfill requirements. The Contractor shall be responsible for any of the cost of changes in waste, borrow, or earthwork quantities from those shown in the plans caused by the requirements of the proposed wall system.

626.7.2-Mechanically Stabilized Earth: The unit price shall include in place: facing elements, soil reinforcing and attachment devices and associated hardware, coping and trim, or similar items that are normal parts of wall construction. No separate ~~measurement~~ payment of these items shall be made.

The unit price shall also include, in place, all the following items shown within the wall pay limits in the plans: select granular backfill, fabric for separation, excavation, embankment, foundation preparation, and leveling pads. No separate ~~measurement~~ payment of these items shall be made.

626.7.3-Cast-in-Place Reinforced Concrete: The unit price shall include in place: concrete, reinforcing, joint materials, underdrains, weepholes, or similar items that are normal parts of wall construction. No separate ~~measurement-payment~~ of these items shall be made.

The unit price shall also include in place: all the following items shown within the wall pay limits in the plans: select material for backfilling, excavation, embankment, fabric for separation, and foundation preparation. No separate ~~measurement-payment~~ of these items shall be made.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 636
MAINTAINING TRAFFIC**

636.6-PILOT TRUCK AND DRIVER OR SHADOW VEHICLE

636.6.2-Shadow Vehicle:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE THE FOLLOWING:

A shadow vehicle shall be furnished by the Contractor and used at the locations called for on the Plans or directed by the Engineer. ~~This vehicle shall be a standard truck weighing between 10,000 GVW (4 536 kg) and 24,000 GVW (10 880 kg) maximum, and shall be A~~ Shadow Vehicle shall consist of a commercial host vehicle equipped with a flashing or rotary yellow beacon which can be seen in all directions and a truck mounted attenuator (TMA) or Trailer Truck Mounted Attenuator (TTMA) mounted on the rear. When the shadow vehicle is no longer needed, it shall be relocated behind a positive barrier or off the job site in a safe location.

Except as allowed for herein, TMA's and TTMA's utilized shall be listed on the Division Approved Products List (APL) for Impact Attenuators – MASH and shall meet the applicable requirements contained in Section 715.41.

The Contractor shall utilize the TMA or TTMA in accordance with the manufacturer's recommendations, shall be responsible for selecting an appropriate host vehicle configured in accordance with and meeting the manufacturer's recommendations, and shall be responsible for taking into consideration all factors such as expected post-impact roll ahead distance for their specific operation at each differing location. In all cases, the Gross Vehicle Weight (GVW) of the host vehicle shall be within the range specified on the APL. This range is based on the parameters of the host vehicle weight(s) utilized during the MASH testing of the device.

For projects let on or prior to December 31, 2022, TMA's and TTMA's not listed on the Impact Attenuators – MASH APL but listed on the Impact Attenuators – NCHRP APL and manufactured on or prior to December 31, 2019 may be utilized.

Test Level 2 devices listed on either the MASH or NCHRP APL's may only be utilized on roadways with a normal posted speed limit of forty (40) MPH or less.

636.12-TEMPORARY IMPACT ATTENUATING DEVICE:

DELETE THE 2ND, 3RD, AND 4TH PARAGRAPHS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

~~The device utilized shall be a model listed on the WVDOT Approved Products Listing (APL) for Safety Devices specifically noted as being approved for temporary work zone use. Specific device selection in regards to manufacturer and model shall be at the Contractor's discretion; however, unless the characteristics of the obstacle to be shielded dictate otherwise, the device utilized shall be a non-tapered, non-gating device. If it is not possible, based on the width of the obstacle to be shielded, to utilize a non-tapered, non-gating device, the Contractor shall utilize an approved Sand Barrel system.~~

~~Notes included on the APL characterize non-gating devices by their National Cooperative Highway Research Program Report 350 (NCHRP 350) crash testing approval level (Test Level 2 or Test Level 3). The Test Level certification required for each particular device to be qualified at shall be based on the normal (non-work zone) posted speed limit in effect at the location of the device. A Test Level 2 or Test Level 3 device shall be utilized if the normal posted speed limit is 40 MPH or less. Otherwise, a Test Level 3 device shall be required. Sand Barrel arrays shall be designed for an impact speed 5 MPH greater than the normal posted speed limit.~~

~~Except as allowed for herein, devices utilized shall be listed in the applicable Class category on the Agency Impact Attenuators – MASH Approved Products List (APL). The type of Impact Attenuator utilized shall be a Test Level 2 or 3, Class 1 or 3 Impact Attenuator as defined in and meeting the requirements of Section 715.41, and as specified in the Plans. If space permits, a Test Level 3 device may be utilized where a Test Level 2 device is specified. Test Level 2 devices shall not be utilized on roadways with normal posted speed limits greater than forty (40) MPH. Only Class 1 devices noted on the APL as being approved for temporary work zone use may be used. All approved Class 3 devices are for temporary or emergency use only. In cases where a Class 3 device is specified, the array shall be properly designed for the obstacle to be shielded and shall be winterized in accordance with the manufacturer recommendations. Class 3 device arrays shall be designed for a minimum of forty-five (45) MPH for Test Level 2 and a minimum of sixty-five (65) MPH for Test Level 3.~~

~~For projects let on or prior to December 31, 2021, devices not listed on the Impact Attenuators – MASH APL but listed on the Impact Attenuators – NCHRP APL and manufactured on or prior to December 31, 2018, may be utilized. Appropriate Test Level Type II, III, VIII, or IX devices on the NCHRP APL noted as being approved for temporary work zone use may be utilized as a Class 1 device. Type V devices on the NCHRP APL appropriately designed for the specified Test Level may be utilized as a Class 3 device.~~

All Temporary Impact Attenuating Devices shall be installed and maintained fully in accordance with the specifications and recommendations of the device manufacturer. This shall include, but shall not be limited to, ~~characteristics of the roadway profile along the approach to the nose of the device and along the adjacent (traffic) side of the device, changes in the roadway grade within the length of the device, side slope and changes in the side slope at the location of the device, lateral slope and changes to lateral slope within the length of the device,~~ anchoring (base to be anchored to as well as the anchoring system), backup, attachment to the obstacle being shielded, transitioning to the obstacle being shielded, winterization, delineation, repair, and cleaning. ~~If the installation requires deviations from the specifications and recommendations of~~

~~the device manufacturer, the Contractor shall obtain written approval from the device manufacturer and shall produce this written approval for review upon request.~~

636.25-PAY ITEMS:

REPLACE 636060 "TEMPORARY IMPACT ATTENUATING DEVICE" WITH THE FOLLOWING AND ADD NOTE 2 AS FOLLOWS:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
<u>636060-*</u>	<u>Temporary Impact Attenuating Device, C-"Class Number", TL-"MASH Test Level" Note 2</u>	<u>Each</u>

Note 2

"Class Number" shall be 1 or 3

"MASH Test Level" shall be 2 or 3

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATIONS

FOR

**SECTION 642
TEMPORARY POLLUTION**

642.1-DESCRIPTION:

DELETE THE FIRST PARAGRAPH AND REPLACE THE FOLLOWING.

This work shall consist of temporary control measures performed during the life of the Contract to control water pollution through use of berms, ditch checks, ~~check dams~~, sediment structures (traps, ponds, or dams), mulches, fiber mats, seeding slope drains, and other erosion control devices or construction methods, in accordance with these Specifications and in reasonably close conformity with the lines, grades, thickness and typical cross sections shown on the Plans or established by the Engineer.

642.4-GENERAL REQUIREMENTS:

DELETE THE FIRST PARAGRAPH AND REPLACE THE FOLLOWING.

The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures as necessary to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment. Such work may involve the construction of temporary berms, ditch checks, ~~check dams~~, sediment structures (traps, ponds or dams), slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion.

642.6-TEMPORARY PIPE, CONTOUR DITCHES, BERMS, SLOPE DRAINS, DITCH CHECKS, SILT FENCE, PREMANUFACTURED DITCH CHECKS AND SUPER SILT FENCE:

642.6.4-Ditch Checks:

DELETE THE TITLE OF SUBSECTION 642.6.4 AND REPLACE WITH THE FOLLOWING:

642.6.4-Ditch Checks (Rock Check Dams):

642.7-METHOD OF MEASUREMENT:

DELETE THE SECOND PARAGRAPH AND REPLACE THE FOLLOWING.

Berms constructed prior to suspension of construction operations and slope drains will be measured in linear feet (meters); ~~check dams will be measured by the unit~~; sediment traps, ponds, or dams and sediment removal will be measured by the cubic yard (meter); for sediment dams, risers will be measured by the unit and conduit for principal spillway under the dam will be measured in linear feet (meters) and included under Item 642008-*; seed will be measured by the pound (kilogram); straw, hay and wood cellulose fiber mulch will be measured by the ton (megagram); wood chips or bark mulch will be measured by the cubic yard (meter); fertilizer and agricultural limestone will be measured by the ton (megagram); matting will be measured by the square yard (meter); contour ditching will be measured by the linear foot (meter). Measurements will be made on the surface of the work done when applicable. Asphalt for anchoring mulch or other chemical binders will not be measured separately, but their cost shall be included in the unit price bid for mulch. Cereal rye or cereal wheat added to Type D mixture in fall seeding will not be included for payment but its cost shall be included in the unit prices in 642.9.

642.9-PAY ITEMS:

DELETE ITEM 642032 (CHECK DAM) FROM THE TABLE.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 663
PAVEMENT MARKINGS**

RENAME THIS SECTION AS FOLLOWS:

**SECTION 663
PAVEMENT MARKINGS AND RUMBLE STRIPS**

663.1-DESCRIPTION:

DELETE THIS SECTION AND REPLACE WITH THE FOLLOWING:

663.1-DESCRIPTION:

663.1.1-Pavement Markings: Pavement markings shall consist of furnishing and installing various types of markings. It shall include, but is not limited to, edge lines, lane lines, center lines, channelizing lines, intersection markings, stripes, curb markings, island markings, and raised markers, or combinations thereof, in accordance with Contract plans and the following specifications or as directed by the Engineer.

All details not specified or shown on the Plans shall conform to the details and requirements set forth in the following publications. These publications shall collectively be referred to as the "pavement marking standards" throughout the remainder of this Section:

1. The WVDOH Standard Details Book, Vol. II, Signing, Signals, Lighting, and Marking, latest issue date
2. The Manual on Uniform Traffic Control Devices for Streets and Highways, latest issue, as printed by the Federal Highway Administration, U.S. Department of Transportation. (Referred to as the MUTCD.)

663.1.2- Rumble Strips: This work consists of furnishing a machine capable of cutting or milling rumble strips on the centerline or edge of roadways in accordance with the details and notes on the plans and as directed by the Engineer.

The Contractor shall pre-mark the location of the center of each cut, and the beginning and ending points of the sections, prior to the installation of the Rumble Strips. The Engineer shall review and approve the locations.

Rumble Strips shall not be installed on bridge decks, loop detector saw-cut locations, structures, approach slabs or in other areas identified by the Engineer.

The method and equipment for constructing ground-in indentations shall be selected by the Contractor and shall meet the requirements of 663.5.10.

Rumble Strips shall be constructed within two (2) inches of the required alignment.

Indentations shall not vary from the dimensions shown on the plans by more than 0.10 inch in depth and five percent (5%) in width.

Finished Rumble Strips not meeting the specified tolerances shall be brought within tolerance by either abrasive grinding, or removal and replacement. The corrective method will be selected by the Engineer. Ground surface areas shall be neat and uniform in appearance. The corrective work shall be at the Contractor's expense.

All removed material shall become the property of the Contractor and disposed of in conformance with provisions in Section 415, "Milling of Asphalt Surfaces" of the Standard Specifications or as approved by the Engineer.

663.5-APPLICATION:

ADD THE FOLLOWING SUBSECTION:

663.5.10- Rumble Strip Equipment: The machine shall consist of a rotary type cutting head with a maximum outside diameter of 12 (twelve) inches (305mm). The cutting tool shall have the cutting head(s) arranged in such a pattern as to provide a relatively smooth cut per milled section without tearing or snagging and be equipped with guides to provide uniformity and consistency in alignment of each cut with respect to the roadway. The strips shall be cut in accordance with the dimensions as detailed on the Plans, and materials resulting from cutting the pavement shall be disposed of and the slots shall be properly cleaned.

663.6-METHOD OF MEASUREMENT:

DELETE THIS SECTION AND REPLACE WITH THE FOLLOWING:

663.6-METHOD OF MEASUREMENT:

663.6.1-Pavement Markings: Pavement markings shall be measured complete in place in the units designated below. Length measurements shall exclude gaps. Calibrated and verified odometer measurements will be acceptable as method of measurement on edge lines (mainline only), lane lines, and centerlines only for plan quantities in excess of 10,000 linear feet (3 000 m) or two linear miles (3.2 km).

Island marking will be measured by the square foot (meter) of island area painted.

Type P-2 markers, Type S markers, and Type R-4 markers shall be measured in units of each, completely installed as specified herein. Payment for the installation of Type P-2 and Type S markers shall include payment for the marker lens, regardless of whether the lens is factory or field installed.

Yield Triangle, Handicapped symbol, Bicycle Symbol, Arrow, Lane Letter, and Railroad Crossing Marking intersection markings shall be measured in units of each, completely

installed as specified herein. One unit of the Railroad Crossing Marking shall consist of the large “X” and the two “R” letters necessary to install the complete marking in one direction.

663.6.2-Rumble Strips: This work shall be measured for payment by the actual linear feet of rumble strips placed and accepted, without regard to the width of the strip. This distance shall be measured longitudinally along the centerline of pavement with deductions for bridge decks, drainage structures, raised pavement markers, loop detector saw-cut locations, and any other sections where Rumble Strips were not installed.

663.7-BASIS OF PAYMENT:

ADD THE FOLLOWING SUBSECTION:

663.7.2-Rumble Strips: The Contract unit price per foot for Rumble Strips will be paid for the pay items listed in Section 663.8. The price shall include furnishing all equipment, tools, labor, and work incidental thereto and also disposal of any waste material resulting from this operation.

663.8-PAY ITEMS:

ADD THE FOLLOWING ITEMS TO THE TABLE:

ITEM	DESCRIPTION	UNIT
<u>663040-*</u>	<u>Edge Line Rumble Strip, “pavement”</u>	<u>Linear Foot (Meter)</u>
<u>663041-*</u>	<u>Centerline Rumble Strip, “pavement”</u>	<u>Linear Foot (Meter)</u>
<u>663042-*</u>	<u>Rumble Strip, ADAB</u>	<u>Linear Foot (Meter)</u>

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**DIVISION OF HIGHWAYS****SUPPLEMENTAL SPECIFICATION****FOR****SECTION 664
TRAFFIC SAFETY DEVICES**

DELETE THE ENTIRE CONTENTS AND REPLACE WITH THE FOLLOWING:

**SECTION 664
IMPACT ATTENUATORS****664.1-DESCRIPTION:**

This work shall consist of the furnishing, assembly, and installation of Impact Attenuators in accordance with these Specifications, Plans, device manufacturer specifications and Installation Drawings, or as established by the Engineer. All work shall be done in a uniform, workmanlike manner.

All details not specified or not shown on the Plans shall conform to the details and requirements set forth in the following specifications and publications:

- i. American Association of State and Highway Transportation Officials (AASHTO), Roadside Design Guide, latest issue including revisions, hereinafter referred to in this Section as the RDG

664.2-MATERIALS:

Materials furnished shall be of new stock, shall be the product of reputable manufacturers, shall conform to the Specifications, and shall meet the approval of the Engineer. Materials shall conform to the general requirements of subsection 715.41 and the requirements of the following subsections:

MATERIALS	SUBSECTION
Class 1 Impact Attenuator	715.41.1
Class 2 Impact Attenuator	715.41.2

Approved devices are listed on the Division Approved Products List (APL) for Impact Attenuators – MASH.

The design width and tapered or non-tapered characteristics of each device are noted on the APL. In cases where a device with tapered sides would normally be required to properly shield an object, the Contractor may at their option choose to provide and install a Class 1 device with non-tapered sides and a rigid tapered transition from the device to the obstacle being shielded, provided specific criteria are met. Criteria to be met and additional drawings to be included with

the Contractor's Installation Drawing submittal are provided in Appendix A of WVDOH Design Directive **XX**, Impact Attenuators. In addition, the transition shall be MASH compliant at the same Test Level as is required for the Impact Attenuator. The Contractor shall provide documentation sufficient in the WVDOH's determination to support this upon request.

664.3-INSTALLATION DRAWINGS:

The Contractor shall submit eight (8) sets of installation drawings for all permanent Class 1 and 2 Impact Attenuators for approval prior to installation. Drawings shall be site specific providing an accurate representation of the obstacle being shielded, approach area, concrete pads and backups to be installed, as well as any required transitions. The drawings shall clearly specify required concrete strength, reinforcement requirements, anchoring requirements, connection to existing barrier requirements, as well as the device brand name and model number. The drawings shall include assembly details.

The installation drawings shall also include all applicable details previously described for any rigid transition to be used to achieve a greater width as allowed for in Section 664.2.

Installation drawings will be reviewed and, if approved, stamped and returned to the Contractor. Multiple devices of the same design to be installed under identical conditions may be represented by one (1) set of drawings.

664.4-CONSTRUCTION METHODS:

All Impact Attenuators shall be placed, assembled, and installed in accordance with the manufacturer specifications and Installation Drawings.

Class 1 devices shall be installed on a concrete foundation, this being a bridge deck or concrete pad fully designed and specified by the manufacturer.

If the manufacturer Installation Drawings require a concrete block backup separate from any concrete backup structure constructed under other provisions of the Specifications, the backup shall be constructed by the Contractor in accordance with the Installation Drawing requirements.

If adhesive type anchors are required to anchor the device, the Contractor shall not fully tighten the device anchors until after the adhesive has fully cured.

When installing a Class 2 Impact Attenuator, the Contractor shall assess the need for soil plates in accordance with the recommendations of the manufacturer and utilize such if recommended. Soil plates shall be utilized regardless of manufacturer recommendations if directed by the Engineer.

The nose or impact head of all devices shall be delineated with a striped, retroreflective panel or decal. The retroreflective material shall meet the requirements for fluorescent yellow Type ASTM-XI retroreflective sheeting, as provided elsewhere within the Specifications. The design of the panel or decal shall be in substantial conformance with the XS-15 design provided in the WVDOH Sign Fabrication Details manual, except all right shoulder mounted devices shall have all stripes sloping down and to the left, and all left shoulder mounted devices shall have all stripes sloping down and to the right.

664.5-METHOD OF MEASUREMENT:

664.5.1-Impact Attenuating Devices: This work shall be measured as a unit, complete and in place.

664.6-BASIS OF PAYMENT:

The quantities, determined as provided above, shall be paid for at the contract unit price for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all work prescribed in a workmanlike and acceptable manner, including all tools, equipment, supplies, and incidentals necessary to complete. All incidental work and materials for which no basis of payment is provided will be considered as completely covered by the prices bid for the items included in the contract.

664.7-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
664005-*	Impact Attenuator, C-"Class Number", TL-"MASH Test Level", "Design Width in Inches"	Each

- * Sequence number
- "Class Number" shall be 1 or 2
- "MASH Test Level" shall be 2 or 3
- "Design Width in Inches" shall be 24, 30, 36, or 36+

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 715
MISCELLANEOUS MATERIALS**

715.41-TRAFFIC SAFETY DEVICES:

DELETE THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

715.41-IMPACT ATTENUATORS:

All Impact Attenuators and associated components furnished shall be crashworthy when assembled, installed, and utilized in accordance with the device manufacturer's instructions. Crashworthy shall be defined as meeting all crash testing performance requirements of MASH at Test Level 2 or 3, as specified in the Plans. This shall include the requirement for detached elements, fragments, or other debris from the device to not penetrate or show potential for penetrating the occupant compartment, or present undue hazard to other traffic, pedestrians, or personnel in a work zone.

All Class 1, 2, and 3 approved devices, as described herein, shall be certified by the manufacturer to meet all applicable requirements contained herein. In addition to requirements contained in the subsections below, this shall include the following:

- i. The device shall perform as designed within the following parameters pertaining to the approach areas to the device. The approach areas shall include the area immediately adjacent to the sides of the device, an area extending fifty (50) ft. in front of the device for front approach impacts, and an area extending fifty (50) ft. to the rear of the device for rear approach impacts:
 - a. Maximum six (6) inch high mountable curb a minimum of eight (8) feet outside of the near face of the device when operating speeds are less than forty-five (45) MPH.
 - b. Maximum four (4) inch high mountable curb a minimum of thirteen (13) feet outside of the near face of the device when operating speeds are forty-five (45) to fifty (50) MPH.
 - c. No curb when operating speeds are greater than fifty (50) MPH.
 - d. Lateral slope 1V:10H or flatter. Lateral slope at the placement location of the device 1V:12H or flatter.
- ii. All components shall be designed, treated, and/or protected to insure long term durability and as-designed performance of the device in all varieties of environmental conditions expected within the State and from deterioration from UV rays. This shall include all metal

components, steel cables, connection hardware, crushable materials and containers for such, hydraulic fluid, piston seals, etc. All steel components shall be galvanized.

Except as otherwise allowed for in the herein, all Impact Attenuators furnished shall be listed on the Division's Approved Products List (APL) "Impact Attenuators – MASH". Impact Attenuators to be furnished shall be defined in the Plans by Class, MASH Test Level, and/or Design Width as further described herein or within Sections 636 and/or 664, with these characteristics of each device noted on the APL.

715.41.1-Class 1 Impact Attenuator: Class 1 Impact Attenuators shall be non-gating Impact Attenuators installed on a concrete pad or bridge deck meeting the manufacturers requirements for permanent applications, or concrete pad, bridge deck, asphalt, base stone, or combination thereof meeting the manufacturers requirements for temporary or emergency applications. Class 1 Impact Attenuators shall be designed to be repairable after impacts within the parameters of those required in MASH, with a substantial portion of the device components being reusable.

Class 1 devices shall consist of a steel base designed to be secured using anchors, associated hardware, and adhesive if required, all of which shall be completely specified by the manufacturer. Class 1 devices shall also consist of a steel framework attached to the base and a mechanism using sacrificial or reusable components designed to dissipate the kinetic energy of vehicles impacting the front of the device head on. Such mechanisms shall utilize cartridges or cylinders designed to be crushed or compressed, steel or other metal components designed to be cut or deformed, devices designed to generate high friction, hydraulic cylinders, or other similar methods. The design of the device may incorporate either proprietary or AASHTO standard versions of the components described. The base and framework shall be designed to typically be reusable except for in the event of severe impacts.

During head on impacts to the front of the device, Class 1 devices shall be designed to collapse rearward with the energy dissipation mechanism bringing the vehicle to a controlled stop. Except for any gating portion at the front of the device, Class 1 devices shall be designed to safely redirect front and rear approaching vehicles diverging off the roadway and impacting into the side of the device. Such vehicles shall be redirected in their original direction of travel and at a low angle of divergence from the side of the device.

Class 1 devices may be designed with a built-in backup mechanism or may be required to be installed with the rear of the device against a solid backup structure such as a concrete block. The manufacturer shall offer and provide various transition designs and components to protect rear approaching vehicles by providing a safe transition from highway industry standard concrete barrier shapes to the rear of the device. The manufacturer shall also offer and provide transition designs and components for transitioning the device to thirty-one (31) inch height double faced w-beam and thrie beam guardrail with off-post splices.

Any portion of the front of a Class 1 Impact Attenuator which is gating shall be no greater than three (3) ft., measured from the nose of the device. The maximum overall length of Class 1 devices, measured from the nose of the device to the rear and not including any transition sections, shall be twenty (20) ft. for MASH Test Level 2 devices and twenty-five (25) ft. for MASH Test Level 3 devices.

The manufacturer shall supply all proprietary components for complete installation of the device, including transition to thirty-one (31) inch height off-post splice double faced w-beam guardrail.

Class 1 Impact Attenuators shall be designed to be repairable by trained maintenance personnel in a reasonable time frame when subjected to impacts similar in nature to those described in the MASH criteria without requiring removal and repairs to the device off-site.

715.41.2-Class 2 Impact Attenuator: Class 2 Impact Attenuators shall be a non-gating Impact Attenuator designed to be anchored into soil using driven or drilled support posts, and to be transitioned to thirty-one (31) inch height double faced w-beam guardrail with off-post splices without modification. Below grade components of Class 2 Impact Attenuators such as post sleeves and soil plates shall be reusable after impacts within the parameters of those required in MASH.

Class 2 devices shall consist of support posts, a steel impact head, steel side rails, a mechanism using sacrificial or reusable components designed to dissipate the kinetic energy of vehicles impacting the front of the device head on, and any other components required for the device such as post blockouts, post sleeves, soil plates, tension struts, cables, etc. The kinetic energy dissipation mechanism may include those described in Section 715.41.2 or other similar methods. The design of the device may incorporate either proprietary or AASHTO standard versions of the components described. In cases where the manufacturer offers options in regard to support post material and/or post sleeves, steel posts with post sleeves shall be supplied and utilized.

During head on impacts to the front of the device, Class 2 devices shall be designed to collapse rearward with the energy dissipation mechanism bringing the vehicle to a controlled stop. Except for any gating portion at the front of the device, Class 2 devices shall be designed to safely redirect front and rear approaching vehicles diverging off the roadway and impacting into the side of the device. Such vehicles shall be redirected in their original direction of travel and at a low angle of divergence from the side of the device.

The manufacturer shall supply all proprietary components for complete installation of the device, including transition to thirty-one (31) inch height off-post splice double faced w-beam guardrail.

Any portion of the front of a Class 2 Impact Attenuator which is gating shall be no greater than twenty (20) ft., measured from the impact head of the device. The maximum overall length of Class 2 devices measured from the impact head of the device to the off-post splice connection with the thirty-one (31) inch height w-beam to be transitioned to shall be fifty (50) feet.

715.41.3-Class 3 Impact Attenuator: Class 3 Impact Attenuators shall be a gating Impact Attenuator designed to be placed on various pad foundation types meeting the manufacturer's requirements, not require anchoring, and to shield wide objects.

During head on and side impacts into the device, Class 3 devices shall be designed to collapse and capture the vehicle, bringing it to a controlled gradual stop by transfer of momentum into an expendable mass of material.

Sand Barrel Class 3 Impact Attenuators shall be designed and provided in standard industry weights, which shall include 200 lb., 400 lb., 700 lb., 1400 lb., and 2100 lb. Sand Barrels shall be approximately thirty-six (36) inches in diameter and shall be designed to facilitate the

drainage of excess sand moisture out of the sand mass. The manufacturer shall have and make available complete instructions on proper array design and layout, as well as pre-designed layouts for various operating speed and object width combinations. The manufacturer shall also provide material, weight/volume, ratio, and mixing specifications for the sand and anti-freeze agent(s) to be added to the barrels. Manufacturer specifications in regard to anti-freeze agents shall be in compliance with all applicable environmental laws and regulations.

Class 3 Impact Attenuators shall not be supplied for permanent installations and are approved only for temporary work zone or emergency use under applicable circumstances.

715.41.4-Truck Mounted Attenuator (TMA) and Trailer Truck Mounted Attenuator (TTMA): TMA's and TTMA's shall be devices designed for attachment to the rear of a large commercial vehicle, intended to offer protection for the occupants of a work zone and to lessen the severity of a rear end impact for the occupants of the impacting vehicle and the commercial host vehicle.

TMA's and TTMA's shall consist of a metal framework and shall incorporate a mechanism designed to dissipate the kinetic energy of vehicles impacting the front of the device head on using sacrificial or reusable component, typically cartridges or cylinders designed to be crushed or compressed, steel or other metal components designed to be cut or deformed, devices designed to generate high friction, or other similar methods.

During head on impacts to the front of the device, TMA and TTMA devices shall be designed to collapse rearward with the energy dissipation mechanism bringing the vehicle to a controlled stop.

TMA's shall be designed to be attached directly to and cantilevered off the rear of the host vehicle. TTMA's shall incorporate an axle and shall be designed to be towed behind the host vehicle.

The manufacturer shall make adequate requirements and recommendations available for necessary modifications to be made to host vehicles to adequately support the device. The manufacturer shall also make available recommended buffer distances for the devices based on expected post impact roll-ahead distances taking into consideration a variety and range of factors such as host vehicle weight, host vehicle speed, impacting vehicle speed, vertical grade, etc.

TMA's and TTMA's shall be equipped with all necessary safety features required for legal highway use such as brake lights, taillights, turn signals and ICC bar lights. The front of the device shall be adequately delineated to provide high conspicuity for approaching traffic.

715.41.5- Product Submission and Approval: Impact Attenuator devices described in Sections 715.41.1 through 715.41.4 to be considered for inclusion on the Division's Impact Attenuator - MASH APL shall be submitted to the Materials Division following the current procedures specified in MP 106.00.02.

The manufacturer should include all relevant documentation and information, including but not limited to product data sheets and bulletins, product specifications and recommendations, product manuals, engineering drawings, and any other requested information.

Devices shall be demonstrable to be crashworthy by means specified in official guidance issued by the WVDOT.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 715
MISCELLANEOUS MATERIALS**

715.9-WARNING DEVICES:

715.9.3-Channelizing Devices and Auxiliary Barriers:

715.9.3.1-Drums:

DELETE BULLET v. AND REPLACE WITH THE FOLLOWING:

- v. Device base design shall be solid rubber snap-on, or sand filled plastic snap-on, or tire ring collar. ~~Ring type bases shall not be approved.~~ Note, if a manufacturer submits a tire ring collar base model drum to the WVDOH for evaluation, the manufacturer shall be required to certify in their MASH self-certification letter that the device is in compliance with the crash performance requirements of MASH with up to two (2) tire ring collars used with the device.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 604
PIPE CULVERTS**

604.2-MATERIALS:

ADD THE FOLLOWING ITEM TO THE TABLE:

MATERIAL	SUBSECTION
<u>Concrete Safety Slope End Section for Arch, Elliptical, or Round Pipe</u>	<u>714.8</u>

604.15-PAY ITEMS:

DELETE ITEM 604071 AND 607473 REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
604071-*	“size” Reinforced Concrete Pipe Safety Slope End Section <u>for Round Pipe</u>	Each
604073-*	“size” Elliptical Reinforced Concrete Pipe Safety Slope End Section <u>for Elliptical Pipe</u> , X	Each